## Family 8. **FISSIDENTACEAE**

By Abel Joel Grout

Plants mostly small. Leaves distichous, lying in a single plane, somewhat contorted when dry, apparently split along the basal portion of the upper edge and clasping the stem and the leaf next above. Leaf-cells small, smooth, mamillose or papillose, as a rule nearly isodiametric, length and breadth rarely more than 1.5 : 1 (except near the base), mostly irregularly hexagonal. Costa well developed (lacking in *F. hyalinus*), varying from shortly excurrent to ending below the apex. Sporophyte lateral or terminal. Seta several times longer than the perichaetial leaves (except in section *Octodiceras*). Peristome single, of 16 forked, highly colored teeth resembling those of *Dicranum* (undivided in a few species).

A very distinct and homogeneous family related to the *Dicranaceae* in peristome structure but unique in leaf characters. The peculiar structure of the leaf has been explained in several ways but the following explanation is now generally accepted. The clasping portion of the leaf represents the original leaf while the rest of the leaf is made up of two lamellae, one dorsal, the other terminal. This is strongly confirmed by the structure of the costa and the fact that the supposed lamella is wanting in the perichaetial leaves and very much reduced or wanting in the earliest stem-leaves. The two parts making up the sheathing base of the leaf are the vaginant or sheathing laminae; the terminal lamella ventral to the costa is the apical lamina; and the lamella dorsal to the costa is the dorsal lamina.

For conciseness in the following descriptions the term apical lamina includes all the leaf above the vaginant laminae.

### 1. **FISSIDENS** Hedw. Sp. Musc. 152. 1801.

*Skitophyllum* Pylaie, Jour. de Bot. Desv. II. **4**: 132. 1814.

Plants mostly under 2 cm. in height. Stem with central strand. Portion of leaf occupied by the vaginant laminae varying but mostly at least half the length of the leaf. Basal leaf-cells usually somewhat larger and more distinct. Capsules oblong to ovoid, erect and symmetric to cernuous and arcuate. Peristome-teeth mostly strongly incurved when moist, the divisions mostly rough and nodulose or spirally thickened and papillose. Operculum conic-apiculate to long-rostrate. Calyptra as a rule barely covering the operculum, smooth, usually entire or split on one side, rarely mitrate.

Type species, *Fissidens exilis* Hedw.

Leaves without costa. 1. Schistostegiopsis.
Leaves with well-developed costa.
  Leaf lamina of a single layer of cells.
    Not aquatic but often in wet places.
      Leaves, at least the perichaetial, bordered by 2–several rows of narrow elongate cells.
        Leaves completely bordered except sometimes at apex (except *F. Brittonii*).
          Leaves soft and flaccid as in the Splachnaceae, much shriveled in drying, cells large. 2. Reticularia.

Leaves firm, merely contorted in drying, cells small.
  Border of only one layer of very long cells (with few exceptions). 3. BRYOIDIUM.
  Border of shorter denser cells often in more than one layer. 4. PYCNOTHALLIA.
Only the vaginant laminae bordered. 5. SEMILIMBIDIUM.
Leaves mostly not bordered, if bordered, border cells not elongate but differing in color or density.
  Leaves entirely unbordered.
    Leaves papillose or strongly mamillose, crenulate by projecting cell angles. 7. CRENULARIA.
    Leaves smooth, or merely mamillose.
      Leaves mostly sharply serrulate (except *F. polypodioides*) at apex, setae lateral. 9. SERRIDIUM.
      Leaves entire or crenulate, setae terminal.
        Plants small, cells clear, large for the genus, incrassate. 6. ALOMA.
        Plants large, densely foliate; leaf-cells mostly small and obscure. 8. AMBLYOTHALLIA.
  Leaves with a border of incrassate or differently colored cells. 10. MARGINATUS.
Aquatic, slender and floating like a Fontinalis. 12. OCTODICERAS.
Leaf lamina of more than one layer of cells; aquatic. 11. PACHYFISSIDENS.

**Section 1. Schistostegiopsis** C. Müll. Linnaea **39**: 362. 1875. Plants mostly minute, delicate, without central strand; leaves without costa; leaf-cells very loose; seta terminal.

## 1. **Fissidens hyalinus** Wils. & Hook. Jour. Bot. Hook. **3**: 89. 1840.

*Conomitrium hyalinum* C. Müll. Syn. **2**: 525. 1851.

Plants 2–3 mm. high, pale green, hyaline; stems mostly simple; leaves 3–5 pairs, the upper much larger, 1–1.5 mm. long, very thin and soft, oblong-lanceolate, acute, entire, ecostate; leaf-cells oblong-hexagonal, about 30 × 45–60 $\mu$, very thin-walled, a single row at the margin narrow and elongated; dioicous; sporophyte terminal; seta 1–2 mm. long; capsule oblong-ovoid, erect and symmetric; calyptra cylindric-conic, covering the beak only; operculum about 1 mm. long, long-rostrate, a little shorter than the urn; peristome normal; spores 11–15 $\mu$ in diameter, in autumn.

TYPE LOCALITY: Bank Lick, near Cincinnati, Ohio.
DISTRIBUTION: On soil and moist rocky ledges in cool shaded ravines, near Cincinnati and near Painesville, Ohio; Washington, Pennsylvania; very rare or overlooked.
ILLUSTRATIONS: Sull. Ic. Musc. *pl. 21;** Jour. Bot. Hook. **3**: *pl. 2*.
EXSICCATI: Sull. Musci Allegh. *180*.

**Section 2. Reticularia** C. Müll. Syn. 2: 525. 1851. Plants small to medium-sized for the genus, gregarious to cespitose, growing on soil; leaves soft and flabby, elongate, acute, strongly bordered all around except occasionally at the apex with long narrow stereid cells (wholly unbordered in *F. Brittonii*), entire or rarely slightly serrulate at the apex, which varies greatly in width; costa ending well below the apex (except in *F. palmatus*); leaf-cells large, parenchymatous, thin-walled and much shrunken when dry, causing the leaves to twist and shrivel and making them slow and difficult to soak out; seta terminal; operculum long-rostrate.

The texture of the leaves and their behavior when dried suggest the leaves of Mniaceae or Funariaceae, but they are much smaller.

Leaves crenulate, wholly unbordered. 2. *F. Brittonii*.
Leaves bordered nearly or quite to apex.
  Costa ending well below apex; capsules erect to horizontal.
    Costa usually ending but a few cells below the apex; capsules erect or inclined, nearly or quite symmetric.
      Border vanishing at apex or apical marginal cells little differentiated; upper leaf-cells up to 13 × 27 $\mu$. 3. *F. dissitifolius*.
      Border distinct to the apex in most leaves; upper leaf-cells up to 40 × 27 $\mu$. 4. *F. mollis*.
    Costa ending far below apex, sometimes in the middle of the apical lamina; capsules horizontal and asymmetric. 6. *F. reticulosus*.
  Costa percurrent or nearly so; capsules asymmetric and horizontal. (Forms of *F. mollis* have an almost percurrent costa.) 5. *F. palmatus*.

* See also Grout, Moss Fl. N. Am. 1: *pl. 11, B;* in that work many illustrations here cited are reproduced.

## 2. **Fissidens Brittonii** Grout, sp. nov.*

Stems short, up to 3.4 mm.; leaves distant, soft and flaccid as in the Splachnaceae, much shriveled when dry and difficult to soak out satisfactorily, up to 2 × 0.5 mm., acute, entirely unbordered, the margins crenulate-serrulate by projecting cells, the costa ending far below the apex; vaginant laminae narrow, up to half the length of the leaf; dorsal lamina attenuate to the stem, wider than the vaginant laminae except near the base; median cells of the apical lamina irregularly oblong-hexagonal, very full of chlorophyll, up to 30 × 13 $\mu$ (mostly smaller), larger and rectangular near the costa, the marginal smaller, about 10 × 13 $\mu$, longer and narrower at apex; cells near the base very loose and elongate, up to 50 $\mu$ long near the costa; cuticular cells of stem also very large and clear; seta terminal, flexuous, long and slender, up to 1 cm.; capsules ovoid, inclined to horizontal, symmetric or asymmetric in the same sod, the urn about 0.6 mm. long, the exothecial cells very incrassate and collenchymatous, nearly isodiametric.

TYPE: Santa Clara, Cuba, *Britton & Wilson 5710.*
DISTRIBUTION: Known only from the type locality.
PLATE 1. *f. 1–7.*

**Fissidens Brittonii** var. **percurrens** Grout, var. nov.† Costa percurrent; borders less crenulate. TYPE: British Honduras, *Mains 3830.* DISTRIBUTION: Known only from the type locality.

## 3. **Fissidens dissitifolius** Sull. Proc. Am. Acad. 5: 274. 1861.

Plants more or less gregarious, propagating by multicellular septate brood-bodies borne on slender filaments from the bases of the leaves; stems slender, flaccid, erect or decumbent, 1–1.5 cm. long; leaves remote, much curled and twisted when dry, about 8–12 pairs, up to 2 × about 0.25 mm., oblong-lanceolate, the margins bordered by 1–2 rows of cells 67–81 $\mu$ long, disappearing toward the apex, where the cells are shorter and subserrulate, the costa thick, more or less flexuous and variable in length, ending below the acute or apiculate apex, sometimes reaching within 4–6 cells of apex; apical lamina about as long as the basal but wider; vaginant laminae much collapsed and shrunken when dry, very oblique at junction with apical lamina, the border of 2–3 rows of cells; dorsal lamina about half as wide as vaginant laminae, tapering to base, ending rather abruptly or slightly decurrent; perichaetial leaves smaller; apical leaf-cells in oblique rows, hexagonal, 13–27 $\mu$, longest next the costa, with thick walls, those of the vaginant lamina longer, up to 65 $\mu$, parallel with the costa; dioicous, the antheridia terminal on more or less branched stems up to 5 mm. high; setae sometimes several, 5–6 mm. long, erect or ascending; capsule straight, cylindric, 1–1.5 mm. long, the walls of irregular hexagonal parenchyma cells up to 40 $\mu$ long, the neck distinct; "calyptra dimidiate"; operculum long-beaked, equaling the urn, the basal cells collenchymatous; annulus falling with the operculum; peristome red, the teeth paler and spirally thickened at apex, their outer basal plates granular, the inner plates cristate-ciliate; spores smooth, 8–10 $\mu$ in diameter, maturing in spring.

TYPE LOCALITY: Cuba.
DISTRIBUTION: On wet rocks or banks of rivulets, in shade; western Cuba; Puerto Rico.
PLATE 1. *f. 8–10.*
EXSICCATI: Sull. Musci Cub. Wright. *14* (type).

* **Fissidens Brittonii;** caulis 3.4 mm. attingens aut minor; folia mollissima oblongo-spatulata vel oblongo-lanceolata, 2 mm. × 0.5 mm., acuta, non limbata, crenulata-serrulata, costa longe sub apice desiniente, duplicatura angusta, folii dimidium attingente; lamina dorsalis ad basim attenuata; laminae apicalis cellulae 30 × 13 $\mu$ attingentes, hexagonales oblongae, marginales minores, 10 × 13 $\mu$, ad basim 50 $\mu$ longitudine attingentes; seta terminalis, flexuosa, 1 cm. alta; capsula ovalis, inclinata ad horizontalis, symmetros vel asymmetros.

† **Fissidens Brittonii** var. **percurrens;** costa percurrens; margo minus crenulata.

### 4. **Fissidens mollis** Mitt. Jour. Linn. Soc. **12**: 600. 1869.

*Fissidens macrophyllus* Mitt. Jour. Linn. Soc. **12**: 600, in part. 1869.
*Conomitrium bryodictyon* Besch. Rev. Bryol. **18**: 50. 1891.
*Conomitrium flexifrons* Besch. Rev. Bryol. **18**: 51, in part. 1891.

Plants gregarious or cespitose, often sterile and propagating by brown, septate brood-bodies borne in clusters on filaments at the base of the leaves; stems erect or ascending, sometimes decumbent and radiculose, stout, up to 1 cm. in length; leaves 10–20 pairs, flaccid, much contracted and twisted when dry, spreading and undulate when moist, not crowded or imbricate, sometimes rather distant, 3–5 × 0.5–0.9 mm. (the smaller sizes more common), narrowly lanceolate, the costa narrow, rarely percurrent, variable in length even on the same stem, generally ending a short distance below the apiculate, occasionally slightly toothed, and somewhat blunt to acute apex; apical lamina about equaling the vaginant laminae in length or somewhat shorter and wider, the margins with a broad, thick, terete border of 4–6 stereid cells; vaginant laminae more or less unequal and contracted to the very oblique junction, the border wider, flattened; dorsal lamina narrow, tapering and bordered to the base, sometimes vanishing with border confluent with the costa; one perichaetial leaf sometimes smaller; apical cells large, distinct, hexagonal, up to 35 × 15 $\mu$, the basal cells longer, up to 60 $\mu$; dioicous; setae sometimes 2 from the same perichaetium, curved or ascending, sometimes geniculate, about 5–8 mm. long; capsules erect or inclined, the urn about 1 mm. long, ovoid with a distinct neck, the walls composed of hexagonal collenchyma cells up to 27 × 40 $\mu$; calyptra a little over 1 mm.; operculum with a long beak, as long as the urn; peristome dark red, the teeth paler and spirally thickened at apex, their basal ventral plates ciliate-cristate, the dorsal plates projecting; spores smooth, 13–16 $\mu$ in diameter, sometimes elliptic, maturing in summer.

TYPE LOCALITY: Near Bath, Jamaica. (Type seen.)
DISTRIBUTION: On rocks in moist woods and on wet banks bordering streams; Cuba; Jamaica; Puerto Rico; Guadeloupe; Martinique; Trinidad; Mexico; Costa Rica; also in South America.
PLATE 1. *f. 14–22.*
NOTE: *F. macrophyllus* is merely a form with percurrent costa and has often been confused with *F. palmatus*. The leaf-apex may occasionally be more acute or more obtuse than in the figure.

### 5. **Fissidens palmatus** (Sw.) Hedw. Sp. Musc. 154. 1801.

*Dicranum palmatum* Sw. Fl. Ind. Occ. 1774. 1806.
*Skitophyllum palmatum* Pylaie, Jour. de Bot. Desv. II. **4**: 146. 1814.

Plants pale green, gregarious and decumbent; stems simple, 1–3 mm. long; leaves 4–6 pairs, palmate-spreading, secund and twisted when dry, up to 2 mm. long, the lowest small and rudimentary, all lanceolate, acute or acuminate, entire or faintly toothed in the cuspidate apex, the margins bordered by 2–3 rows of long yellow cells, usually continuous to the apex, rarely lacking on the dorsal lamina of the lower leaves, the costa percurrent except in the lower leaves; vaginant laminae about half the length of the leaf, very oblique at the junction, lax, the border wider and indistinct at base; dorsal lamina narrowing to base; cells laxly reticulate, irregularly oblong-hexagonal, up to 30 × 10–15 $\mu$ or larger in the upper leaves, with thick walls, those of the vaginant laminae oblong or hexagonal, up to 50 × 18 $\mu$, those of the dorsal lamina up to 54 × 18 $\mu$, parallel with the vein, the border often ending above the base; rhizautoicous, the antheridia in basal buds with only 2 pairs of small leaves; seta geniculate, becoming erect, up to 5 mm. long, red and stouter at base; capsule horizontal, asymmetric and slightly curved, about 1 mm. long, the neck distinct, stomatose, the walls with oblong cells 21 × 13 $\mu$ in diameter, those around the mouth smaller, denser and irregular, the urn up to 0.8 mm., the basal cells of collenchyma; calyptra minute, subulate; operculum conic-rostrate, nearly as long as the urn; annulus falling with the operculum; peristome red, the teeth paler and spirally thickened at apex, with projecting outer plates at base, the inner plates cristate; spores up to 10 $\mu$ in diameter.

TYPE LOCALITY: Jamaica.
DISTRIBUTION: On clay; Jamaica.
ILLUSTRATIONS: Hedw. Descr. **3**: *pl. 30, A;* Jour. de Bot. Desv. II. **4**: *pl. 38, f. 6.* PLATE 2. *f. 30–34.*
NOTE: The border at the leaf-apex in *F. palmatus* is of shorter, more oblique cells than in *F. mollis*.

### 6. **Fissidens reticulosus** (C. Müll.) Mitt.
Jour. Linn. Soc. **12**: 603. 1869.

*Conomitrium reticulosum* C. Müll. Syn. Musc. **2**: 525. 1851.
*Fissidens sphagnifolius* Sull. Proc. Am. Acad. **5**: 275. 1861.
*Fissidens Lindbergii* Mitt. Jour. Linn. Soc. **12**: 602. 1869.
*Conomitrium palmatulum* Besch. Rev. Bryol. **18**: 50. 1891. (Sterile.)
*Conomitrium Hookeriaceum* C. Müll. Bull. Herb. Boiss. **5**: 173. 1897.
*Fissidens Hookeriaceus* Paris, Index Bryol. Suppl. 160. 1900.

Plants gregarious; stems simple or branching by basal innovations, not more than 2 mm. long, erect or decumbent; leaves spreading palmately, 4–9 pairs, flaccid, much twisted when dry, flexuous when moist, increasing in size upward, up to 3 mm. long, lanceolate-acuminate, the margins entire or sometimes slightly serrulate at the apiculate apex, the border narrow, of 1–2 rows of cells, sometimes ending a short distance below the apex, the costa sometimes extending only half the length of the apical lamina; vaginant laminae less than half the length of the leaf, ending obliquely, unequal, the border slightly wider; dorsal lamina narrowing to the base, of a few rows of cells; cells of apical lamina oblique, up to 40 × 13 $\mu$, rhomboidal or hexagonal, much collapsed when dry, the basal cells longer and parallel with the vein, up to 81 × 8–13 $\mu$; rhizautoicous or pseudodioicous, the antheridia in small basal buds; setae (occasionally multiple) terminal, slender and flexuous, geniculate, becoming erect, curved at apex, 5–10 mm. long; capsule suberect to asymmetric and inclined, ovoid, the neck short, stomatose, the urn less than 1 mm. long, shorter than the operculum, the walls dense with obscure, square or oblong, inflated collenchyma cells up to 27 $\mu$ in diameter; calyptra small, covering only the beak of the conic-rostrate operculum; peristome red at base, the teeth paler and spirally thickened above, their dorsal segments projecting, the ventral segments lamellate; spores smooth, pale yellow, 10–13 $\mu$ in diameter, maturing in September.

TYPE LOCALITY: Mirador, Mexico.
DISTRIBUTION: On moist soil in woods; West Indies; Mexico; also in Central America.
PLATE 1. *f. 11–13.*
EXSICCATI: Sull. Musci Cub. Wright. *19.*

**Section 3. Bryoidium.** C. Müll. Gen. Musc. 56. 1901. Subsect. *Limbatus* Grout, N. Am. Moss Fl. **1**: 8. 1936. Plants mostly small, bright green, gregarious, growing chiefly on soil, occasionally on rocks; leaves soft, bordered all around except occasionally at the apex; border one cell thick, of long linear cells; cells of the lamina mostly hexagonal, thin-walled, not obscure, smooth except in *F. yucatanensis* which has a large central papilla on each side of the cell; sporophyte terminal; peristome-teeth with the forks mostly spirally thickened.

Leaves slightly or not at all decurrent.
  Leaf-cells smooth.
    Leaf-border confluent with the costa in most leaves (see *F. tortilis, F. Kegelianus, F. angustifolius*). 9. *F. bryoides.*
    Leaf-border ceasing below apex.
      Plants 1–5 cm. long, usually submerged (Pacific Coast). 13. *F. rufulus.*
      Plants rarely over 5 mm., not submerged except at high water.
        Capsules symmetric, erect to inclined.
          Border of vaginant laminae edged with small short cells below.
            Costa reaching apex; capsules mostly inclined and asymmetric. 10. *F. limbatus.*
            Costa ending several cells below the apex; capsules mostly erect. 14. *F. sublimbatus.*
          Border of vaginant laminae not edged with small short cells below.
            Synoicous; leaf-cells about 8 $\mu$ in diameter, those of the vaginant laminae little or not at all enlarged. 15. *F. repandus.*
            Dioicous: most leaf-cells larger than 8 $\mu$.
              Plants 5–25 mm. high. 16. *F. viridulus.*
              Plants rarely 3 mm. high.
                Leaf-cells of vaginant laminae only occasionally noticeably larger than those of the dorsal and ventral. 12. *F. minutulus.*
                Leaf-cells of vaginant laminae reaching twice the dimensions of the dorsal and ventral.
                  Leaves linear-lanceolate. 7. *F. angustifolius.*
                  Leaves oblong-lanceolate. 8. *F. Kegelianus.*

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|---|---|
| Capsules more or less asymmetric, inclined to horizontal. | |
| Leaves mostly oblong-lingulate, more or less apiculate; border nearly reaching the apex. | 16a. *F. viridulus* var. *tamarindifolius*. |
| Leaves oblong-lanceolate; border ceasing some distance below the apex; plants of the Gulf States. | 16b. *F. viridulus* var. *brevifolius*. |
| Leaf-cells with a single large central papilla. | 17. *F. yucatanensis*. |
| Leaves long-decurrent, even to the next leaf. | 11. *F. longidecurrens*. |

## 7. **Fissidens angustifolius** Sull. Proc. Am. Acad. **5**: 275. 1861.

*Fissidens Bernoullii* Schimp.; C. Müll. Bull. Herb. Boiss. **5**: 173. 1897.
*Fissidens Lindigii* var. *latifolius* Varde & Thér.; Thér. Mem. Soc. Cub. Hist. Nat. **13**: 207. 1939.

Scarcely distinguishable from *F. Kegelianus;* leaves very long, up to 2.5 mm. wide, narrowly linear-lanceolate.

TYPE LOCALITY: Cuba.
DISTRIBUTION: Haiti; frequent in Puerto Rico; Trinidad (*E. G. Britton, D. Coker & W. R. Rowland 1384*); probably elsewhere in the West Indies.
PLATE 2. *f. 23–29*.
EXSICCATI: Sull. Musci Cub. Wright. *18* (type).
NOTE: This species is evidently closely related to *F. Kegelianus* and probably one is a derivative of the other. This is probably better regarded as a subspecies or variety,* for intergradations are numerous and it is often a puzzle to which species a given plant should be referred. *F. Lindigii* (Hampe) Paris is a minute species with much the same structure.

## 8. **Fissidens Kegelianus** C. Müll. Linnaea **21**: 181. 1848.

? *Skitophyllum longifolium* Pylaie, Jour. de Bot. Desv. II. **4**: 150. 1814.
*Fissidens pseudo-bryoides* Schlieph. Bot. Zeit. **13**: 424. 1855.
*Fissidens clavipes* Sull. Proc. Am. Acad. **5**: 275. 1861.
*Fissidens monandrus* Mitt. Jour. Linn. Soc. **12**: 598. 1869.
*Fissidens trinitensis* Hampe; Jaeger, Ber. St. Gall. Nat. Ges. **1874–75**: 123. 1876.
*Conomitrium flexifrons* Besch. Rev. Bryol. **18**: 51, in part. 1891.
*Conomitrium crassicolle* Besch. Rev. Bryol. **18**: 51. 1891.

Differs from *F. minutulus* in the more slenderly acuminate, narrowly oblong-lanceolate leaves, with a stronger border reaching almost or quite to the costa and often finely but sharply toothed near the apex, sometimes nearly entire; leaf-apex much like that of *F. bryoides*, but the plants much smaller than in that species and the leaves narrower; basal cells, especially those of vaginant laminae, much larger than those of the upper leaf (12 $\mu$), variable in size, up to 15 × 30 $\mu$, but the broadest cells not the longest; dioicous (monoicous according to Mitten); capsule erect and symmetric, with a distinct neck, the urn 0.4–0.6 mm. long, obconic to obconic-cylindric, contracted under the mouth when dry and empty; exothecial cells quadrate, collenchymatous; operculum long-rostrate, sometimes nearly as long as the urn; spores smooth, about 9 $\mu$ in diameter, maturing in late spring or early summer.

TYPE LOCALITY: Surinam.
DISTRIBUTION: Florida from Polk County southward, usually on limestone, also on the bases of palms and on soil, especially clay; Cuba, Haiti, Jamaica, Puerto Rico, St. Thomas, St. Croix, Antigua, Guadeloupe, and Martinique to Trinidad and Dutch Guiana; Mexico.
ILLUSTRATION: Grout, Moss Fl. N. Am. 1: *pl. 7, E*.
EXSICCATI: Sull. Musci Cub. Wright. *11* (as *F. minutulus*).
NOTE: The cells of the vaginant laminae of *F. minutulus* are often somewhat enlarged next the costa, but only to a slight degree as compared with this species.

This species seems near to *F. minutulus* and should probably † be regarded as a subtropical variant of that species.

Mr. Williams made drawings of what was sent to the New York Botanical Garden as the type of *Skitophyllum longifolium* and identified two specimens of *F. Kegelianus* as "probably *Fissidens longifolius*." But Mrs. Britton stated in her notes that this specimen did not correspond with the original description. It is almost certain that this is either *F. Kegelianus* or one of the known *Reticularia*, since Bridel (Bryol. Univ. **2**: 682) compares it with *F. palmatus*.

* This statement and others like it express the best judgment of the author, who does not, however, wish to be dogmatic to the extent of reducing the species. For a discussion of his attitude the reader is referred to a paper entitled "The Species Concept" (Bryologist **41**: 49, 50. 1938).

† See footnote to *F. angustifolius*.

## 9. **Fissidens bryoides** Hedw. Sp Musc. 153. 1801.

*Fissidens synoicus* Sull. Musci U. S. 103. 1856.
*Fissidens inconstans* Schimp. Syn. ed. 2. 114. 1876.

Stems 5–25 mm. high; leaves few to many pairs, oblong, rather abruptly short-acuminate in typical forms, in others more obtuse and apiculate, the upper and perichaetial 1.5–2 mm. long, the border strong (especially on the vaginant laminae), typically confluent with the costa at the leaf-apex but often vanishing slightly below it, the vaginant laminae half the length of the leaf; leaf-cells variable in size and shape, mostly irregularly hexagonal, 8–12 $\mu$, sometimes bulging; autoicous; ♂ buds in the lower leaf-axils; capsule typically erect and symmetric, sometimes inclined, the median exothecial cells mostly oblong with very thick longitudinal walls; spores in winter.

TYPE LOCALITY: Germany.
DISTRIBUTION: Mostly on moist soil; Canada and the U. S. east of the Rockies, south to the Gulf; Vancouver I.; on limestone, in Deering Hammock near Miami, Fla.; Puerto Rico (*Steere 6052, 6058, 5657*); also in Europe.
ILLUSTRATIONS: Bryol. Eur. (17:) *pl. 101* (as *F. exilis*); Braithw. Brit. Moss-Fl. 1: *pl. 10, E.*
EXSICCATI: Drummond, Musci Am. *113* (in part); Sull. Musci Allegh. *185;* Sull. & Lesq. Musci Bor. Am. *82;* Aust. Musci App. *100;* Holz. Musci Acroc. Bor. Am. *80b;* Macoun, Can. Musci *121;* Grout, N. Am. Musci Perf. *173.*

NOTE: Most specimens from the Pacific Coast prove to be *F. limbatus*. The Puerto Rican specimens have cells more bulging than usual. This bulging of cells in *Fissidens* species with smooth leaves is not uncommon. The time of maturing spores and the broader perichaetial leaves with the erect capsule seem the best characters for distinguishing this species from *F. minutulus*. The difference in the exothecial cell walls is doubtfully important. In leaf-border, leaf-cells, shape of capsule, and structure of peristome there is little constant difference between the two.

**Fissidens bryoides** var. **incurvus** (Weber & Mohr) Hübener, Musc. Germ. 219. 1833. *Dicranum incurvum* Weber & Mohr, Bot. Tasch. 161. 1807. *Fissidens incurvus* Schwaegr. Suppl. 1$^2$: 5. 1816. *Fissidens Bambergeri* Schimp. Syn. ed. 2, 115. 1876. Leaf-border less often reaching apex; capsules curved and cernuous. TYPE LOCALITY: Germany. DISTRIBUTION: With the species. ILLUSTRATIONS: Jennings, Mosses W. Pa. *pl. 10;* Braithw. Brit. Moss-Fl. 1: *pl. 10, C;* Grout, Moss Fl. N. Am. *pl. 5* (as *F. bryoides*). NOTE: This is the *F. incurvus* of most European authors and exsiccati. It has been so puzzling because it has included *F. tamarindifolius* Brid., *F. texanus* Lesq., and often also forms of *F. limbatus* Sull. The distinctions between these are not always clear, but the differences are usually ascertainable by careful study. Most of the "*F. incurvus*" in American herbaria belongs to the other species mentioned. The illustration in Bryol. Eur. *Pl. 99* represents *F. viridulus* and its var. with curved capsules, which I believe to be the *F. tamarindifolius* of Bridel, Braithwaite, and Limpricht. It would have been much better had *F. bryoides* been described as having both erect and curved capsules and no variety named. *F. incurvus* is treated as a variety of *F. bryoides* because the reported differences in inflorescence, shape of capsule, and structure of leaves are either negligible or exceedingly inconstant.

## 10. **Fissidens limbatus** Sull. Pacif. R. R. Rept. 4: 185. Mosses *pl. 1.* 1857.

Scarcely to be distinguished from broad-leaved forms of *F. bryoides* var. *incurvus* except by the smaller, more uniform and more regularly arranged leaf-cells, usually not more than 10 $\mu$ in diameter and arranged in almost regular longitudinal rows; the margin is also rather wider on the vaginant laminae, sometimes with shorter cells on the outer edge, and it usually ends a little below the leaf-apex; antheridial buds usually frequent and conspicuous in the lower leaf-axils; capsules light brown, inclined to horizontal and somewhat asymmetric, contracted below the mouth when dry and empty; spores in winter.

TYPE LOCALITY: California.
DISTRIBUTION: On moist shaded soil; California to New Mexico, Vancouver Island and Alberta; Puerto Rico (*Steere 5290*); apparently common at least in California.
ILLUSTRATION: Pacif. R. R. Rept. 4, Mosses *pl. 1.*
EXSICCATI: Sull. & Lesq. Musci Bor. Am. *105;* Holz. Musci Acroc. Bor. Am. *279, 356, 80, 480* (as *F. incurvus*); Grout, N. Am. Musci Perf. *232, 297;* Baker, Pacif. Slope Bryoph. *373.*

NOTE: Although the distinctions between this and forms of the preceding are so slight, they seem pretty constant. In some tufts there may be some capsules erect and symmetric.

**Fissidens limbatus** var. **brevifolius** (Card. & Thér.) Grout, comb. nov. *Fissidens pusillus* var. *brevifolius* Card. & Thér.; Baker, Pacif. Slope Bryoph. *368.* 1902. *Fissidens limbatus* var. *ensiformis* Grout, Moss Fl. N. Am. 1: 13. 1936. Leaves narrow; perichaetial leaves narrowly lanceolate-acuminate. TYPE LOCALITY: California. DISTRIBUTION: California, Oregon, Arizona. EXSICCATI: Baker, Pacif. Slope Bryoph. *368.*

## 11. **Fissidens longidecurrens** Thér. Smithson. Misc. Coll. 78²: 10. 1926.

*Fissidens flexuosus* Thér. Smithson. Misc. Coll. 78²: 11. 1926.

Stems 7–12 mm. high; leaves 12–15 pairs, smaller below, contorted when dry, soaked out with difficulty, oblong-lanceolate, broadly acuminate, subacute, 1.2–2.0 × 0.4–0.5 mm., the border of 1–2 rows of narrow cells (6–8 rows on vaginant laminae), not reaching the apex, the costa vanishing just below the apex; vaginant laminae two-thirds to three-fourths the length of the leaf; dorsal lamina long-decurrent, sometimes reaching the leaf below; leaf-cells obscure, 6–7 $\mu$, irregular, thin-walled; dioicous; seta geniculate-flexuous, 3 mm. long; capsule suberect, nearly symmetric, oblong but narrowed at base; operculum conic-rostrate.

TYPE LOCALITY: Morelia, Loma Santa Maria, Mexico (*Arsène 4892, 4906;* isotype seen).
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Smithson. Misc. Coll. 78²: *f. 6*.

NOTE: The author states that the species is close to *F. Pringlei*, differing in the smaller leaf-cells and decurrent leaves. The only noticeable differentiating characters of *F. flexuosus* (*Arsène 4824;* isotype seen) are the less decurrent, non-crispate leaves. The latter character may well be the result of the preparation of the specimens. The decurrency of leaves is often quite variable.

## 12. **Fissidens minutulus** Sull. Mem. Am. Acad. II. 3: 58. 1848.

*Fissidens viridulus* var. *pusillus* Wils. Bryol. Brit. 303. 1855.
*Fissidens incurvus* var. *pusillus* Schimp. Syn. 104. 1860.
*Fissidens pusillus* Wils. in Milde, Bryol. Siles. 82. 1869.
*Fissidens pusillus* var. *madidus* Spruce, Jour. Bot. 18: 361. 1880.

Plants very small, 1–3 mm. long, 5 mm. at the utmost; lower leaves small and in young plants often scarcely margined, the upper, especially the perichaetial, narrowly lanceolate, often somewhat curved, 0.24–0.3 × 1–1.2 mm., the stem leaves at most 0.45 mm. wide, usually in 3–4 pairs, occasionally more, acute, often apiculate, the border mostly ending below the apex and the apical margin usually somewhat irregular to faintly serrulate, the costa percurrent in the upper leaves; vaginant laminae about half the length of the leaf, the sides often unequal; dorsal lamina narrowed at base and reaching the stem in the upper leaves only, as a rule; leaf-cells irregularly quadrate to rectangular-hexagonal, about 10 $\mu$ in diameter but varying greatly in size and shape, some reaching 15 $\mu$ in longest dimension, those of the vaginant laminae near the costa often elongated to 22 $\mu$; mostly dioicous; seta 3–4 mm. long; capsule erect or inclined, strongly contracted below the mouth when dry and empty, obovoid, the urn reaching 0.7 mm. in length but usually shorter, the operculum conic-apiculate to rostrate, often nearly as long as the urn, the exothecial cells quadrate to rounded-hexagonal above, rectangular below with rounded corners, collenchymatous, the longitudinal walls much thicker than the transverse; peristome-teeth deep red, deeply cleft, very rough and subspirally thickened with rather obscure markings; spores about 15 $\mu$ in diameter, ripening from August to September (occasionally as late as November at Washington, D. C.).

TYPE LOCALITY: Northeastern United States.
DISTRIBUTION: Common on wet rocks in cool shaded places, occasionally on moist banks, rarely on limestone; eastern Canada and the United States south to the Gulf of Mexico; occasionally west of the Rocky Mountains.
ILLUSTRATIONS: Mem. Am. Acad. II. 3: *pl. 2, A;* Sull. Ic. Musc. *pl. 24;* Braithw. Brit. Moss-Fl. 1: *pl. 10, B;* Jennings, Mosses W. Pa. *pl. 10*.
EXSICCATI: Drumm. So. Mosses *39, 40* (as *F. bryoides*); Sull. Musci Allegh. *183* (type); Sull. & Lesq. Musci Bor. Am. *80* (at least in part); Aust. Musci App. *102;* Holz. Musci Acroc. Bor. Am. *105, 105b;* Grout, N. Am. Musci Perf. *182*.
NOTE: The confusion in the North American *Bryoidia* is so great that a satisfactory arrangement is scarcely possible at present because there are such great variations in size, inflorescence, border, and shape of capsule within the recognized specific limits. Sullivant (Ic. Musc. 37) says of *F. minutulus* "caulis 2–3 lineas vel ultra," i.e. 4–6 mm.; Barnes (Bot. Gaz. 12: 6) says 1 mm. or less. Dixon (Handb. ed. 3, 126) says that *F. pusillus* var. *madidus* Spruce is a synonym of *F. minutulus* and is larger than typical *F. pusillus*. I agree with Cardot and Brotherus that *F. pusillus* is a synonym of *F. minutulus*, but I feel sure that *F. minutulus* merges into *F. viridulus* and that *F. viridulus* in turn merges into *F. bryoides* through their varieties. *F. bryoides* in turn seems to have developed into subspecies *limbatus* on the Pacific Coast. The confusion is made still greater by the fact that no two authors mean exactly the same thing by the names they use. I feel sure that what Barnes called *F. incurvus* was a composite of forms of *F. minutulus, viridulus, bryoides,* and occasionally *limbatus,* having curved capsules. The summer-maturing spores may prove one of the best means of identifying *F. minutulus*.

## 13. **Fissidens rufulus** B.S.G. Bryol. Eur. (46–47:) Fiss. Suppl. **2**: 1. 1851.

*Fissidens ventricosus* Lesq. Mem. Calif. Acad. **1**: 7. 1868.
*Fissidens hydrophilus* Jaeger, Enum. Fissid. 20. 1869.

Plants the largest of the *Bryoidia*, 1–3 cm. high, rarely more, dark green, blackish below, sparingly branched, with dark rhizoids among the leaves; leaves oblong-cultriform, obtuse to apiculate, 1.5–2.5 mm. long, the border nearly or quite as large in the upper quarter of the leaf as elsewhere, almost reaching the apex, the costa strong, ending in the apex; vaginant lamina one-half to two-thirds the length of the leaf; dorsal lamina reaching the stem; leaf-cells irregularly hexagonal, the upper median 8–12 $\mu$ in longest dimension, the lower larger; dioicous; seta 3–4 mm. long; capsule symmetric, erect or slightly inclined, the urn 1–1.4 mm. long, the operculum conic; peristome-teeth less roughened above and with spiral thickenings more pronounced than in other North American *Bryoidia;* spores 20–28 $\mu$ in diameter, maturing in winter.

TYPE LOCALITY: Germany.
DISTRIBUTION: On submerged rocks in streams; California to Washington and Idaho; rare.
ILLUSTRATIONS: Bryol. Eur. (46–47:) *pl. 102;* Braithw. Brit. Moss Fl. 1: *pl. 11, B;* Dixon, Handb. ed. 3, *pl. 16, K;* Sull. Ic. Musc. Suppl. *pl. 30.*
EXSICCATI: Holz. Musci Acroc. Bor. Am. *107;* Grout, N. Am. Musci Perf. *309.*

NOTE: The leaves of American plants as a rule are wider than those of the European and the red at the base of the stems found in the latter is apparently lacking in the American plants. In Holzinger's Musci Acroc. Bor. Am. *107* the strong border all but reaches the slightly excurrent costa, approaching the European *F. rivularis* in this respect. All our *Bryoidia* are variable and puzzling and seemingly intergrading. *F. rufulus* seems to be the only one in which there is any noticeable difference in the teeth. The exothecial cells vary little from those described for *F. pusillus.* The seta is usually much longer than the perichaetial leaves in *F. rufulus,* Sullivant's figures notwithstanding.

## 14. **Fissidens sublimbatus** Grout, Moss Fl. N. Am. 1: 13. 1936.

Plants smaller than *F. limbatus* or *F. viridulus;* leaves distant below, crowded above, oblong-lingulate, obtuse and minutely toothed and apiculate at the apex, 1–1.5 mm. long, the border not reaching the apex, the costa ending a few cells below the apex; dorsal lamina ending some distance from the stem, usually abruptly; border of the vaginant laminae wide and edged below with 1–2 rows of short subquadrate cells; leaf-cells obscure, bulging, the upper about 7 $\mu$ wide, subquadrate, regular and arranged in perceptible rows, longitudinal and transverse; capsules small, erect and symmetric or nearly so, the urn about 1 mm. long, obovoid, the operculum short-rostrate, the exothecial cells quadrate with rounded corners, collenchymatous; spores in winter.

TYPE LOCALITY: Shaded ledge, Tanque Verde Mts., Pima County, Arizona (*E. B. Bartram 1613*).
DISTRIBUTION: Arizona (*E. B. Bartram 1296, 1554*) and New Mexico (Guadalupe County, *Orcutt 7168*).
ILLUSTRATION: Grout, Moss Fl. N. Am. 1: *pl. 13, A.*

NOTE: Resembles *F. limbatus* in the small, regularly arranged leaf-cells and the wide border of the vaginant laminae, edged with small short cells.

## 15. **Fissidens repandus** Wilson; Mitt. Jour. Bot. & Kew Misc. **3**: 52. 1851

*Fissidens tortilis* Hampe & C. Müll.; C. Müll. Bot. Zeit. **22**: 340. 1864.
*Fissidens reclinatulus* C. Müll. Bull. Soc. Roy. Bot. Belg. **31**: 153. 1892.
*Fissidens Carionis* C. Müll. Bull. Herb. Boiss. **5**: 171. 1897.
*Fissidens fasciculato-bryoides* C. Müll. Bull. Herb. Boiss. **5**: 172. 1897. (According to E. G. Britton.)
*Fissidens aequalis* Salmon, Ann. Bot. **13**: 120. 1899.
*Fissidens Pringlei* Card. Rev. Bryol. **36**: 69. 1909.
*Fissidens reclinatulus* var. *brevifolius* Card. Rev. Bryol. **36**: 69. 1909.
*Fissidens Heribaudii* Broth. & Paris; Card. Rev. Bryol. **40**: 33. 1913. (*Arsène 4604, 4609.*)
*Fissidens Arsenei* Broth. & Paris; Thér. Smithson. Misc. Coll. **78**[2]: 8. 1926.
*Fissidens tortilis* var. *cubensis* Thér. Mem. Soc. Cub. Hist. Nat. **13**: 205. 1939.

Plants small, light yellowish, crisped, simple; leaves a few (up to 12) pairs, the lower remote, the upper close, when moist slightly crisped-undulate, lanceolate, the border whitish, subentire; dorsal lamina attenuate toward the base, often not reaching the stem; vaginant laminae more widely bordered; apical lamina with whitish costa vanishing in a very short mucro; leaf-cells about 8 mm. in diameter, hexagonal, subopaque, more pellucid with age, those of the base and vaginant laminae little different; perichaetial leaves similar to the others; dioicous; antheridia few, on a separate plant in a terminal bud; seta short, ascending, flexuous, becoming purple; capsule erect, symmetric, oblong, small, the operculum conic, acute, oblique, the annulus very narrow, persistent; spores in winter.

TYPE LOCALITY: Mexico. (*Arsène 4275*, Hacienda Alamos, det. by Thériot as *F. Pringlei*).
DISTRIBUTION: Florida; West Indies (*Steere 5302, 7174*); Mexico.
ILLUSTRATION: Grout, Moss Fl. N. Am. 1: *pl. 7, D.*

NOTE: A miniature of *F. bryoides*, similar in general appearance to *F. Kegelianus;* the plants seem a little larger. Some sterile forms are hard to distinguish from *F. viridulus;* such are the Arsène specimens named by Thériot *F. reclinatulus* var. *brevifolius* Card.; but in general they are narrower and much more slenderly acute, the border more nearly reaching the apex; the capsules are much more distinctive, small and delicate with a neck more or less pronounced and without the thickened cell walls found in *F. viridulus* and *F. bryoides;* they may be erect or inclined. The serrulate leaves shown in Grout, Moss Fl. N. Am. 1: *pl. 7, D* are unusual and rare.

Specimens from Mexico have the border fused with the costa at the apex and entire; in specimens from Honduras the costa is excurrent for a cell or two, and the border does not quite reach the apex, which is almost or quite entire; in the Pineola, Florida, specimens the apex is like the Honduran except that it is often finely and sharply toothed with projecting cell-angles and the costa usually vanishes in the apex. Plants from Pineola are synoicous, but there are other small plants bearing a few antheridia in a terminal bud. It is possible that these may have been attached to the female plants at base and broken apart in scraping from the limestone.

In *F. aequalis* Salmon the costa and border are shorter than usual.

## 16. **Fissidens viridulus** (Sw.) Wahl.

Fl. Lapp. 334. 1812.

*Dicranum viridulum* Sw. Jour. Bot. Schrad. **1800**: 177. 1801.
*Fissidens impar* Mitt. Jour. Linn. Soc. **21**: 554. 1885.
*Fissidens bryoides* var. *Hedwigii* Limpr. in Rab. Krypt.-Fl. **4**[1]: 429. 1887.
*Fissidens bryoides* var. *viridulus* Broth. Laubm. Fennosk. 18. 1923.

Plants about the size of *F. bryoides;* leaves typically rounded-obtuse and apiculate, the margin not reaching the apex, often lacking in young leaves except on the vaginant laminae; capsule symmetric, erect or inclined.

TYPE LOCALITY: Europe.
DISTRIBUTION: On moist shaded soil; New England to Vancouver Island, south to the Middle Atlantic States; rare west of the Rockies. A sterile form approaching the European *F. crassipes* has been collected on stones in streams at Strathaven, Pa. (*Krout*), at Raleigh, N. C. (*Blomquist*), and in Tennessee (*Sharp*).
ILLUSTRATIONS: Bryol. Eur. *pl. 99*, in part; Braithw. Brit. Moss-Fl. *pl. 12*, C, D.*
EXSICCATI: Rab. Bryoth. Eur. *1160.*

NOTE: So closely related to *F. bryoides* that it is often difficult to distinguish from it. On the other hand sterile plants are often hard to distinguish from *F. minutulus.*

Plants collected in a well at New Haven, Connecticut, by Browne in 1878 and named *F. bryoides caespitans* by Eaton are almost perfect *F. viridulus*, rather slender because of the shaded habitat. I have seen no American *F. caespitans.*

Dixon's note (Handb. 120) that "the long, very acute leaves distinguish this plant [*F. pusillus*] from *F. viridulus*, but specimens may often be found with leaves broader and more approaching that plant" is in the main true, but I find narrow leaves on plants that mature spores in late autumn. Immature plants are mostly indistinguishable.

**Fissidens viridulus** var. **tamarindifolius** (Turner) Grout, Moss Fl. N. Am. 1: 12. 1936. *Dicranum tamarindifolium* Turner, Musc. Hib. 55. 1804. *Fissidens tamarindifolius* Brid. Bryol. Univ. 684, in part. 1827. *Fissidens incurvus* var. *tamarindifolius* Braithw. Brit. Moss-Fl. 1: 69. 1881. Differs from the species chiefly in the curved and more or less inclined capsule. TYPE LOCALITY: Scotland. DISTRIBUTION: With the species. ILLUSTRATION: Braithw. Brit. Moss-Fl. 1: *pl. 12*, H.*

**Fissidens viridulus** var. **brevifolius** (Ren. & Card.) Grout, comb. nov. *Fissidens texanus* Lesq.; Lesq. & James, Man. 86. 1884. *Fissidens incurvus* var. *brevifolius* Ren. & Card. Bot. Gaz. **14**: 94. 1889. *Fissidens viridulus* var. *texanus* Grout, Moss Fl. N. Am. 1: 12. 1936. Leaves oblong-lanceolate, acute to acuminate, the border mostly ending some distance below the apex and more or less lacking on the lower leaves and those of young plants; perichaetial leaves narrower and more narrowly acute above; capsules more or less asymmetric, inclined to arcuate. TYPE LOCALITY: Texas. DISTRIBUTION: Very common on bases of trees, cypress knees and less frequently on stones in swampy places in the Gulf States; also in Georgia. NOTE: There is no absolute certainty that

this common form is the *F. texanus* of Lesq. since no trace of the type is to be found. Wright's specimen in Herb. Sull. (Harvard University) is probably the type. It is common and likely to be noted as different from the general run of what was known as *F. incurvus*. It was collected at Caloosa, Florida by J. D. Smith in 1878 and called *F. incurvus*, but it is easily distinguished from the northern form as noted above. The leaf-apex is like that of *F. taxifolius* except that it lacks the border.

### 17. **Fissidens yucatanensis** Steere, Am. Jour. Bot. 22: 397. 1935.

Plants small, 4–8 mm. high, light green, unbranched, somewhat caespitose, flaccid, erect; leaves 4–12 pairs, the lower smaller, distant, the upper larger, crowded and imbricated, with a stout flexuous costa confluent with the border, and occasionally excurrent into a small apiculus, oblanceolate to ligulate with a wide, obtuse or somewhat acute apex, the narrow borders and the straight costa not reaching the apex; vaginant laminae reaching slightly more than half-way to the apex; dorsal lamina ceasing abruptly at the base, not at all decurrent, crenate at the lower angle by the projecting marginal cells; upper leaf-cells irregularly polygonal to hexagonal, 24–32 $\mu$ in diameter, not elongated, bearing a single large distinct papilla on the middle of each exposed surface, except on the vaginant laminae, where the inner face is smooth, the single row of cells adjacent to the costa often larger and nearly hyaline, those of the basal region larger, about 48 $\mu$ long, rectangular, those at the extreme base smooth; dioicous; antheridia and archegonia in terminal clusters; sporophyte unknown.

TYPE LOCALITY: Muna, Yucatan (Steere *2129*).
DISTRIBUTION: Muna and Uxmal (Steere *2034*), Yucatan.
ILLUSTRATION: Am. Jour. Bot. 22: 398. *f. 1–6.*
NOTE: The large and distinct central papilla of each leaf-cell is unique and striking for *Bryoidium*. The author remarks that it appears to be related to *F. angustifolius* Sull., but to me this relationship is not very apparent, for *F. angustifolius* has the enlarged basal cells in the vaginant laminae, as in *F. Kegelianus*.

**Section 4. Pycnothallia** C. Müll. Gen. Musc. 59. 1901. Plants with leaves bordered nearly or quite to the apex with a strong cartilaginous border, usually of shorter cells than in *Bryoidium;* leaf-cells very small, obscure, papillose (except in *F. Steyermarkii*); seta terminal; forks of peristome-teeth spirally thickened.

| | |
|---|---|
| Leaf-border complete, reaching apex and fusing with excurrent or percurrent costa. | |
| Leaf-cells papillose, not incrassate; setae multiple, 3 mm. | 18. *F. plurisetus.* |
| Leaf-cells smooth, incrassate; setae single, ±6 mm. | 19. *F. Steyermarkii.* |
| Leaf-border not reaching apex, often forked. | 20. *F. Weiri.* |

### 18. **Fissidens plurisetus** E. Bartr.; B. Willis, Bryologist 42: 153. 1939.

Plants rather robust, laxly gregarious, sordid green; stems to 8 mm. high, 3 mm. wide with leaves, densely foliate; leaves in about 15 pairs, the lower minute, the upper to 2 mm. long, oblong-lanceolate, shortly acute, bordered all around, the border cartilaginous, pellucid, 2 cells thick and minutely scabrous on the edges by projecting cell ends, 5–6 cells wide on the vaginant laminae and about 3 cells wide above, sharply defined from the opaque lamina cells, the costa pellucid, percurrent; dorsal lamina ending in a rounded lobe at the leaf-base; cells uniform, very minute, 4–5 $\mu$, dense and obscure, papillose; ? dioicous; setae aggregated, up to 4 from one perichaetium, 3 mm. long, arcuate above; capsules suberect, the urn 0.5 mm. long; peristome-teeth highly cristate on the inner face below the forks.

TYPE LOCALITY: Barro Colorado Island, Canal Zone (*Willis*).
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Bryologist 42: 157. *f. 1, a–d.*

### 19. **Fissidens Steyermarkii** E. Bartr., sp. nov.*

* **Fissidens Steyermarkii;** terrestris, sat robustus; caulis ad 1.5 cm. longus, 3–4 mm. latus; folia plurijuga, patentia, ad 3.5 mm. longa, 0.6 mm. lata, oblongo-lanceolata, breviter acuminata, ubique limbata, limbo cartilagineo, bistratoso, costa percurrenti; cellulae hexagonae, 8–10 $\mu$, distinctae, haud vel lenissime papillosae; dioicus; seta solitaria, terminalis, circa 8 mm. longa; operculum conicum, intense rubrum; peristomii dentes aurantiaci, profunde divisi, cruribus erectis, grosse et dense papillosis; spori pallidi, papillosi, diam. 10–18 $\mu$.

Rather robust, dull green, terrestrial plants, densely gregarious; stems to 1.5 cm. long and 3–4 mm. wide with leaves, sparsely radiculose below; leaves in numerous pairs, the lower minute, gradually larger upward, the upper to 3.5 × 0.6 mm., lightly contorted when dry, erect-spreading and often flacate when moist, oblong-lanceolate, short-acuminate, bordered all around, the border strong, cartilaginous, bistratose and confluent with the percurrent costa at the apex; cells distinct, hexagonal with firm pellucid walls, 8–10 $\mu$ in diameter, smooth or very faintly papillose; dioicous; seta terminal, solitary, about 8 mm. long; capsule inclined, the urn 1 mm. long; operculum short, conical, deep red; peristome-teeth about 375 $\mu$ high, deeply bifid, the forks erect, coarsely and densely papillose; spores pale, papillose, 10–18 $\mu$ in diameter.

TYPE: Volcán Tajumulco, Dept. San Marcos, Guatemala, alt. 2300–2500 m., *Steyermark 36576*.
DISTRIBUTION: Guatemala.
PLATE 3. *f. 35–40*.

NOTE: Although evidently near *F. plurisetus* E. Bartr. of Panama the distinctions are sharply defined and well maintained. In *F. Steyermarkii* the setae are consistently solitary in all three collections representing over one hundred fruiting plants; in all parts the plants are about twice the size of *F. plurisetus* and the leaf-cells by contrast are distinct and smooth or very faintly papillose.

## 20. **Fissidens Weiri** Mitt. Jour. Linn. Soc. **12**: 602. 1869.

*Conomitrium Lefebvrei* Besch. Rev. Bryol. **18**: 53. 1891.
*Fissidens Nicholsonii* Salmon, Ann. Bot. **13**: 123. 1899.
*Fissidens Howelli* E. Bartr. Proc. Calif. Acad. IV. **21**: 78. 1933.
*Fissidens Eckmani* Thér. Mem. Soc. Cub. Hist. Nat. **13**: 205. 1939.
*Fissidens Bizoti* Thér. Mem. Soc. Cub. Hist. Nat. **13**: 205. 1939. (*Acuña 329.*)
*Fissidens Acunae* Varde & Thér.; Thér. Mem. Soc. Cub. Hist. Nat. **13**: 206. 1939.

Plants with curled and recurved leaves when dry, about 5 mm. high, the sterile usually taller, up to 1 cm.; stems about 2 mm. wide from tip to tip of leaves, simple or branching by apical innovations or with several erect branches from old decumbent stems; leaves up to 10 pairs, on slender sterile stems up to 30 pairs, about 1.35 × 0.33 mm., overlapping the stem at base, auriculate, the dorsal lamina ending in a rounded base below the terminus of the border; apical lamina bordered to below the apex, the point serrulate; cells with 2 papillae; costa about 27 $\mu$ wide, translucent, bent outward at the junction of the vaginant laminae and ending in the apiculate apex; cells dense and opaque, small, only 8–10 $\mu$ in diameter, the papillae minute, sometimes developed on the border, which also occasionally forks and extends downward into the cells of the lamina; vaginant laminae unequal, oblique to the costa; perichaetial leaves 1–2, shorter and narrower, the upper leaves of the plant often more cuspidate or mucronate at apex; autoicous, the antheridia axillary in small buds; seta terminal, bent and curved, up to 2–3 mm. long; capsules cylindric, contracted below the mouth when old, erect, 0.57–0.66 mm. long; calyptra covering only the beak of the operculum, which is oblique; annulus of 2 rows of pale cells, falling with the operculum; peristome dark red, the teeth incurved, with deep fimbriate lamellae and spirally thickened slender points; spores up to 8–10 $\mu$ in diameter, maturing from February to April (?).

TYPE LOCALITY: Brazil, Parana, Fazenda de Lageada, alt. 2000 ft. (*Weir 24;* type seen).
DISTRIBUTION: Guadeloupe (*Marie 100*, as *F. varians* Besch. in herb. Mitt.); Jamaica, base of Jim Crow Peak, 5000–5500 ft. (*Underwood*); Puerto Rico, in wet shaded ravines (*E. G. Britton 2897, 6127*); frequent (*Steere 4325*, etc.; *Pagán 363*).
PLATE 3. *f. 41–46*.

NOTE: Remarkable for the variability of the border which forks and penetrates the small densely papillose cells of the lamina, and is either smooth or papillose or serrulate; also for the rounded or auriculate lobe at the base of the dorsal blade and for the variation in the cuspidate apex of the upper leaves; also for the axillary or basal antheridia; all of which may be found in one specimen and led Bescherelle to call it *F. varians*. Possibly this was because it was also mixed with another minute species related to *F. Garberi* in *Marie 100*, Guadeloupe. The above description was taken from Mrs. Britton's notes at the N. Y. Bot. Garden.

In an examination of several specimens collected by Steere in Puerto Rico, 1939–1940, I found no axillary antheridial buds but did find a male plant with only the vaginant laminae bordered, otherwise like the other plants in the same mat. This leads to the possibility that the leaves on the male plants are less bordered; but on a single female plant one finds leaves with the border normal and only the vaginant laminae bordered, and others with a trace of border on the dorsal lamina. The innermost perichaetial leaf is often much smaller, narrower, and imperfectly bordered. The leaves vary greatly in width, especially at and near the apex. The border is often lacking in the lower leaves and usually ends in the dorsal lamina below by an ingrowing branch. In the same

colony may be found plants with the leaves entirely bordered except near the apex, others with only the vaginant laminae bordered, others with vaginant laminae and a portion of the dorsal lamina bordered, and other similar combinations. The border, where present, is strong and often toothed, and also often sends branches in among the lamina cells. The border apparently never extends to the base of the dorsal lamina, but ends in an inwardly directed prong some distance above the base. The border-cells, where the true border is lacking, usually have two marginal papillae. A form from Trinidad has the border reaching the apex (*E. G. Britton, D. Coker & W. R. Rowland 1386*).

*Steere 7224* contains some plants that are normal *F. Weiri* and others of the following variety.

**Fissidens Weiri** var. **insertus** Grout, var. nov.* Leaves oblong, more broadly acute; border of vaginant laminae mostly normal; that above the vaginant laminae very narrow, and placed just inside a row or two of normal lamina-cells, as in many species of *Calymperes;* border of dorsal lamina the same as in the apical lamina but often forking and sending short branches in among the lamina-cells, or altogether lacking, or sometimes coming out to the margin. TYPE: El Yunke Rd., Sierra de Luquillo, Puerto Rico, *Steere 4207*. DISTRIBUTION: Known only from the type locality.

**Section 5. Semilimbidium** C. Müll. Gen. Musc. 60. 1901. Subsect. *Semilimbatus* Grout, Moss Fl. N. Am. 1: 8. 1936. Plants small to medium-sized; leaves bordered on the vaginant laminae only, often on the perichaetial leaves only, smooth or papillose, entire or crenulate on the margin; sporophyte terminal; peristome-teeth forked (except *F. muriculatus*).

Leaves smooth or cells merely bulging; nearly entire.
- Costa nearly or quite percurrent.
  - Border largely intermarginal. — 21. *F. Andersoni.*
  - Border marginal.
    - Border on perichaetial leaves only; peristome-teeth forked. — 26. *F. exiguus.*
    - Border on all upper leaves; peristome-teeth not forked.
      - Subtropical; peristome-teeth not divided. — 30. *F. Neoni.*
      - Arctic; sporophyte unknown. — 22. *F. arcticus.*
- Costa plainly ending below leaf-apex.
  - Northern; leaves obtuse. — 31. *F. obtusifolius.*
  - Subtropical; leaves acute. — 32. *F. pseudoexilis.*

Leaves papillose; mostly crenulate.
- Border intramarginal.
  - Leaves linear-lanceolate, gradually acute. — 24. *F. densiretis.*
  - Leaves oblong to oblong-lanceolate, more abruptly acute.
    - Plants larger; leaves up to 15 or more pairs. — 24a. *F. densiretis* var. *latifolius.*
    - Plants smaller; leaves up to 7 pairs. — 23. *F. Brouardi.*
- Border marginal.
  - Border extending to apex of vaginant lamina or beyond. — 25. *F. elegans.*
  - Border at basal portion of vaginant lamina only.
    - Leaf-cells pleuripapillate.
      - Costa ending below apex; only perichaetial leaves bordered. — 27. *F. Garberi.*
      - Upper leaves also bordered.
        - Leaves up to 20 pairs; upper marginal cells showing mostly but one marginal papilla. — 28. *F. leptopodus.*
        - Leaves up to 10 pairs; upper marginal cells showing mostly two marginal papillae. — 33. *F. Ravenelii.*
    - Leaf-cells with only one large sharp papilla; only perichaetial leaves bordered. — 29. *F. muriculatus.*

## 21. **Fissidens Andersoni** Grout, Moss Fl. N. Am. 1: 252. 1939.

Plants up to 6 mm. long, rarely branching; leaves contorted to slightly crisped when dry, up to 8 or more pairs, up to 1.4 × 0.5 mm., mostly smaller, oblong to oblong-lanceolate, abruptly to gradually acute, the margins entire, without papillae, the costa usually ending two or more cells below the apex but occasionally percurrent; vaginant laminae extending about half the length of the leaf, bordered in the fertile stems by a narrow band of 2–3 narrowly linear cells, which towards the leaf-base are usually reduced to a single row inside a row or two of quadrate marginal cells; dorsal and apical laminae not bordered; in some sterile plants the border present in the upper leaves only; upper leaf-cells hexagonal, somewhat irregular, 12–15 $\mu$ in diameter, smooth, sometimes somewhat bulging-mamillose, the basal cells more elongate and rectangular; only undeveloped terminal archegonia found, with perichaetial leaves not fully developed.

* **Fissidens Weiri** var. **insertus;** folia oblonga, late acuta, limbo intramarginato supra duplicaturam; limbus dorsalis idem, limbus duplicaturae non intramarginatus.

TYPE LOCALITY: Wet soil, floor of cypress swamp near Currituck, Currituck Co., North Carolina, May 15, 1939 (*Lewis E. Anderson 6505;* type at Duke University).
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Grout, Moss Fl. N. Am. **2**: *pl. 115, B.*
NOTE: The larger smooth cells distinguish this species easily from *F. Ravenelii* and *F. Garberi,* which plainly show papillae along the marginal cells. The leaves of *F. Neoni* are entirely different, smaller, ovate, with elongate cells and border often found on dorsal lamina.

## 22. **Fissidens arcticus** Bryhn, 2nd Arc. Exp. Fram 11: 57. 1906.

Plants gregarious or intermixed with other bryophytes, bright green, darker with age; stems erect, naked at base, 5–20 mm. high, simple or sparingly branched, with the leaves scarcely 1.25 mm. wide; leaves usually 6–12 pairs, reaching 1 mm. in length, erect-open, lanceolate, acute, often faintly serrate near the apex, the costa mostly ending a little below the apex; vaginant laminae extending at least two-thirds the length of the leaf, bordered by a narrow margin of linear cells; border lacking on lower leaves and young shoots; dorsal lamina not reaching the stem, often ending one-third the length of the leaf from the base, not bordered; leaf-cells irregularly four-sided to hexagonal, 7–10 $\mu$ in diameter, not much rounded at the angles; sporophyte unknown.

TYPE LOCALITY: King Oscar Land, Ellesmere Island.
DISTRIBUTION: Ellesmere Island; Greenland.
ILLUSTRATIONS: 2nd Arc. Exp. Fram. 11: *pl. 1, f. 2.* PLATE 3. *f. 47–50.*
NOTE: Distinguished from *F. exiguus* by the smaller size, smaller and more distant leaves, which are not or barely overlapping, and faintly toothed at the apex; dorsal lamina ending some distance from the leaf-base; all leaves except the minute basal ones margined on the vaginant laminae and the margin often extending slightly onto the apical lamina; costa with few exceptions ending perceptibly below the apex. The leaves at the base of the stem are very small, gradually growing larger and then suddenly becoming smaller again, then again gradually becoming larger, this alternation repeated 2 or 3 times. This seems to indicate a seasonal growth for 2 or 3 years or more.

## 23. **Fissidens Brouardi** Thér. Smithson. Misc. Coll. **78**[2]: 11. 1926.

Plants small, the short stems scarcely 2 mm. high, simple; leaves 5–7 pairs, the lower minute, gradually growing larger upwards, 0.8–1.2 × 0.25–0.35 mm., oblong-lanceolate, obtusely acute, crenulate-serrulate by projecting cells above, many of the marginal ones having two marginal papillae, the costa vanishing below the apex; vaginant laminae fully half the length of the leaf, bordered below by 2–4 series of elongate cells which at base at least are partially intra-marginal; dorsal lamina attenuate, reaching the stem; leaf-cells obscure, pleuripapillate, the upper about 6 $\mu$, the lower larger, many quadrate to rectangular; rhizautoicous; seta up to 2 mm. long; capsule obovoid, the urn about 0.4 mm. long; exothecial cells rectangular, thick-walled.

TYPE LOCALITY: Morelia, Loma Santa Maria, Mexico (*Arsène 7558*).
DISTRIBUTION: Mexico.
ILLUSTRATION: Smithson. Misc. Coll. **78**[2]: 12. *f. 8.*
NOTE: Type duplicate from U. S. National Museum examined. From *F. Ravenelii* it is distinguished by the smaller size and shorter costa, as well as the intramarginal border. From *F. Garberi* by having all the upper leaves bordered. No other collections known.

## 24. **Fissidens densiretis** Sull. Proc. Am. Acad. 5: 274. 1861.

Stems slender, simple or branching by innovations, up to 1 cm. or more high; leaves 20–25 pairs, close to overlapping, erect at a very narrow angle with stem, up to 1.1 mm. long, narrowly linear-lanceolate, gradually narrowed from the base to the acute or subobtuse apex, crenulate by projecting cell-angles, the costa strong, pellucid, ending just below the apex; vaginant lamina one-half to two-thirds the length of the leaf; dorsal lamina attenuate to the stem or often ending in a narrow rounded base; leaf-cells obscure, irregular but nearly isodiametric, papillose, the projecting marginal ones transversely elongate, a border of 1–2 rows of linear cells at base of the vaginant laminae just inside the marginal cells; dioicous; sporo-

phyte terminal; seta about 3 mm. long; capsule oblong-obovoid, 0.6–0.8 mm. long, the operculum long-rostrate.

TYPE LOCALITY: Cuba.
DISTRIBUTION: Apparently growing on moist rocks, West Indies (*Marie 128, 562, 1019; Steere 4239, 5898*).
PLATE 4. *f. 51–54; 59–62.*
EXSICCATI: Sull. Musci Cub. Wright *13.*

**Fissidens densiretis** var. **latifolius** Grout, var. nov.* Leaves oblong, more abruptly acute; perichaetial leaves more heavily margined but not intramargined. TYPE: Puerto Rico, *Steere 6686.* DISTRIBUTION: Puerto Rico (*Steere 6686, 5636*) and Guadeloupe (*Marie 114*).

## 25. **Fissidens elegans** Brid. Musc. Recent. Suppl. 1: 167. 1806.

*Skitophyllum elegans* Pylaie, Jour. de Bot. Desv. II. **4**: 152. 1814.
*Fissidens intermedius* C. Müll. Linnaea **21**: 181. 1848.
*Fissidens cuspidulatus* Sull. Proc. Am. Acad. **5**: 274. 1861.
*Conomitrium hemiloma* Besch. Rev. Bryol. **18**: 52. 1891.
*Fissidens flavifrons* Besch. Rev. Bryol. **18**: 54. 1891.
*Fissidens Hancockiana* Steere, Rep. Hancock Exp. **3**[1]: 2. 1936.
*Fissidens Willisiae* E. Bartr.; B. Willis, Bryologist **42**: 152. 1939.

Plants in scattered cushions; stems slender, erect or decumbent, usually simple, rarely proliferous from old stems, the fertile ones 1–5 mm. with 3–10 pairs of leaves, the sterile sometimes 1 cm. high with 15–25; leaves generally distant, not crowded or overlapping, often somewhat secund at apex when dry, 1 × 0.25 mm., generally all but the very lowest bordered on the vaginant laminae, the costa stout, clear, percurrent to very shortly excurrent into a short sharp point, rarely ending slightly below the apex in a few large clear cells, in cross section with large guides and 2 stereid bands; vaginant laminae extending about two-thirds the length of the leaf, unequal and oblique, the border often toothed, the margins plane, crenulate with projecting cell-angles, often with 2 papillae; upper leaf-cells obscure, irregularly polygonal, ± 5 $\mu$ in diameter with 1–2 papillae, those of the vaginant laminae hexagonal to short-rectangular, up to 10 $\mu$, with 2–4 papillae on the outer surface only; dorsal lamina extending nearly or quite to base, ending abruptly, papillose on both surfaces; perichaetial leaves somewhat longer with vaginant laminae very unequal, sometimes one side narrowed to the costa; dioicous or autoicous, the antheridia either terminal on full-sized plants or in small buds from lateral innovations on old plants or from radicles; sporophyte terminal; seta erect or bent at base, up to 4–5 mm. long, sometimes 2 from the same perichaetium; calyptra small; operculum rostrate; annulus narrow and hyaline; capsule oblong to ovoid, erect or inclined, nearly or quite symmetric, 0.75–1 mm. long, contracted below the mouth when dry, the exothecial cells quadrate to oblong-rectangular, 27 $\mu$ long, more or less collenchymatous and incrassate (nodose in type), the dry neck often swollen with large stomata; peristome-teeth spreading when dry, strongly incurved when moist, cristate-ciliate at base, spirally thickened at the apex of the forks; spores smooth, 10–13 $\mu$ in diameter, maturing from February to May.

TYPE LOCALITY: Hispaniola (*Poiteau;* type seen).
DISTRIBUTION: On soil and moist stones; West Indies; Mexico; South America.
ILLUSTRATIONS: Jour. de Bot. Desv. II. **4**: *pl. 39, f. 18;* Bryologist **42**: 157. *f. 2, a–d;* Rep. Hancock Exp. **3**[1]: *pl. 1, f. 1–3.* PLATE 4. *f. 55–58.*
EXSICCATI: Sull. Musci Cub. Wright *16, 21,* in part.
NOTE: Differs from *R. Ravenelii* in the larger size, in the leaves which are all bordered on the vaginant laminae, and in the smaller basal exothecial cells. None of the forms of *F. elegans* is yet known from the United States.

Mrs. Britton states in her notes that "*F. hemiloma* Besch. from Guadeloupe collected by Ed. Marie at LeGommier no. 646, Ex. Hb. Bescherelle is a mixture of two species, one of which is referable to the above." I have seen and examined this, also Musci Cub. Wright *16.* The type of *C. hemiloma* has vaginant laminae only about half the length of the leaf. The isotype of *F. intermedius* has vaginant laminae only a little more than half the length of the leaf. *C. hemiloma* and *F. intermedius* may be separate species, or varieties. The latter has leaf-cells about 7 $\mu$. *Ule 236,* from Brazil, comm. to N. Y. Bot. Garden by Brotherus as *F. acicularis,* is *F. elegans.* The border on the vaginant laminae of Sullivant's *F. cuspidulatus* is narrower and weaker than on the general run of *F. elegans.*

* **Fissidens densiretis** var. **latifolius;** folia oblonga, abruptissime acuta; folia perichaetialia valdissime limbata, non intramarginata.

## 26. **Fissidens exiguus** Sull. Mem. Am. Acad. II. **3**: 60. 1846.

*Fissidens viridulus* var. *Lylei* Wils. Bryol. Brit. 304. 1855.
*Fissidens incurvus* var. *exiguus* Aust. Musci App. 19. 1870.
*Fissidens pusillus* var. *Lylei* Braithw. Brit. Moss-Fl. **1**: 68. 1881.

Plants very small, 1–2 mm. high; leaves 3–6 pairs, the upper reaching 1 mm. in length, the perichaetial a little longer, narrowly oblong-lanceolate, acute to rounded-obtuse, smooth, the margin entire or rarely slightly irregular near apex, usually only the vaginant laminae of the perichaetial leaves bordered, the costa usually vanishing 2–3 cells below apex; upper median leaf-cells 8–15 $\mu$ in longest dimension, irregularly rounded-hexagonal; dioicous; seta 2–4 mm. long, pale; capsule erect and symmetric or somewhat inclined, the urn reaching 0.6 mm. long, the exothecial cells oblong, strongly collenchymatous; operculum long-conic to short-rostrate, about two-thirds the length of the urn; divisions of peristome-teeth spirally thickened and very strongly papillose; spores 15–20 $\mu$ in diameter, mature in summer.

TYPE LOCALITY: Near Columbus, Ohio.

DISTRIBUTION: On stones in moist shaded places; King Oscar Land, southeastern Canada and northern United States east of the Rockies, south to North Carolina and southern Missouri (*Drew*); Honduras (*Wilson 4*); Puerto Rico (with long narrow perichaetial leaves, *Steere*); Bermuda (*E. G. Britton 322*).

ILLUSTRATIONS: Mem. Am. Acad. II. **3**: *pl. 2, B;* Sull. Ic. Musc. *pl. 23;* Jennings, Mosses W. Pa. *pl. 11.*

EXSICCATI: Sull. & Lesq. Musci Bor. Am. *79;* ed. 2, *80,* in part (according to Barnes, Bot. Gaz. **12**: 6. 1887); Aust. Musci App. *103.*

NOTE: Not common. Occasional plants have a very narrow border on the dorsal and apical laminae.

**Fissidens exiguus** var. **falcatulus** (Ren. & Card.) Grout, Moss Fl. N. Am. **1**: 15. 1936. *Fissidens falcatulus* Ren. & Card. Bot. Gaz. **19**: 237. 1894. Leaves less crowded, outwardly curved; vaginant laminae of all leaves narrowly bordered, the border sometimes extending a little beyond the vaginant laminae. TYPE LOCALITY: On bark of trees, Catahoulou near Mandeville and Bayou Alexandre, Louisiana, 1890–1891 (*A. B. Langlois*). DISTRIBUTION: Known only from the type locality. ILLUSTRATION: Bot. Gaz. **19**: *pl. 21, B.* EXSICCATI: Ren. & Card. Musci Am. Sept. Exs. *210.*

**Fissidens exiguus** f. **emarginatus** Grout, Moss Fl. N. Am. **1**: 15. 1936. Leaves lingulate, rounded-obtuse and short-apiculate; border lacking in most plants (occasionally traces of border on vaginant laminae). TYPE LOCALITY: On the ground, Chincahua Mts., Arizona, alt. 4000 ft., Feb. 1906 (*Leiberg 805*). DISTRIBUTION: Known only from the type locality.

## 27. **Fissidens Garberi** Lesq. & James, Proc. Am. Acad. **14**: 137. 1879.

Plants gregarious, often minute, seldom more than 2–3 mm. high, occasionally up to 5 mm.; stems sometimes decumbent and branching by lateral subapical innovations, usually erect and simple with 4–8 pairs of leaves, the sterile stems taller with 18–20 pairs; leaves more or less secund when dry, spreading when moist, crowded and increasing in size upwards on fertile stems, small, seldom more than 0.6–0.8 × 0.15–0.20 mm., oblong to oblong-lanceolate, on sterile stems generally all unbordered, the costa short and clear, ending rather abruptly a little below the acute-obtuse apex, usually bent at the junction with the vaginant laminae, in cross section showing 3 central guide cells and a few outer parenchyma cells, but no stereid bands; cells of apical lamina 5–8 $\mu$ in diameter, in cross section 13 $\mu$ thick, dense, with 2–4 small papillae, the margins finely crenulate-serrulate, the marginal cells truncate and deeper than wide, often with 2 marginal papillae; vaginant laminae about half the length of the leaf, somewhat contracted, sometimes unequal and oblique at the junction, almost always unbordered except obscurely at the base of the perichaetial leaves, the basal cells oblong, up to 10 $\mu$, all less papillose than in the apical part and smooth on the inner surface; dorsal lamina tapering to or ending abruptly at or above the base, papillose on both surfaces; perichaetial leaves longer, up to 1 × 0.15–0.25 mm., somewhat falcate and bordered only at the base of the vaginant laminae by 1–2 rows of elongated cells, the border occasionally lacking on one of the blades; pseudodioicous; antheridia terminal on small plants or autoicous and axillary; seta terminal, 1.5–2 mm. long, bent at base or curved; capsule small, 0.5–1 mm. long, erect, contracted below the mouth when old, the upper exothecial cells and the base of calyptra collen-

chymatous, the lower cells clear and swollen, up to 40 $\mu$ in diameter, the operculum beaked, equal to the urn; annulus pale and narrow; peristome strongly incurved, the teeth spirally thickened at apex, cristate-ciliate at base (the segments projecting on the margins of the inner face); spores 10–13 $\mu$ in diameter, maturing in early spring, with minute papillae in lines.

TYPE LOCALITY: Florida.

DISTRIBUTION: On base of trees, dead wood, and shells, or in crevices of limestone rocks; Florida to Louisiana (apparently frequent in southern and central Florida); Wisconsin (*Cheney*); Mexico; Central America; West Indies.

ILLUSTRATIONS: Grout, Moss Fl. N. Am. 1: *pl. 7, A*.

EXSICCATI: Holz. Musci Acroc. Bor. Am. *410, 435;* Grout, N. Am. Musci Perf. *195*.

## 28. **Fissidens leptopodus** Card. Rev. Bryol. **37**: 120. 1910.

*Fissidens michoacanus* Thér. Smithson. Misc. Coll. 78[2]: 12. 1926.

Plants small, about 3 mm. high; leaves 7–20 pairs, about 1.25 × 0.3 mm., oblong-lanceolate, acute, the costa nearly or quite percurrent into the sharp point; vaginant laminae unequal, about half the length of the leaf, in upper leaves often with one or two long narrow cells on the lower portion, the other parts unbordered, crenulate by projecting cells which often show two marginal papillae; dorsal lamina reaching the stem, ending rather abruptly; leaf-cells with multiple or compound papillae, obscure, irregularly polygonal to subquadrate, about 7 $\mu$ near the costa, smaller near the margin; autoicous; antheridial buds axillary or at end of short branches; seta terminal, bent at base, 3–4 mm. long; capsule erect to inclined, small, oblong, contracted under the mouth when dry; calyptra mitriform, narrow; operculum long-rostrate; peristome-teeth divided into two long filiform prongs, spirally thickened above.

TYPE LOCALITY: Jalapa, State of Vera Cruz, Mexico (*Barnes & Land 558;* mixed with *F. hemicraspedophyllus* Card.).

DISTRIBUTION: Mexico; Guatemala (*Lundell 2022*); Puerto Rico (*Steere 5434, 6801,* etc.; *Britton & Schafer 1651*); Trinidad (*E. G. Britton, D. Coker & W. R. Rowland 1210*).

ILLUSTRATION: Smithson. Misc. Coll. 78[2]: 13. *f. 9*.

NOTE: Cardot says in his original description of the leaves "ubique immarginata," which is not true. There is considerable difference in the width of the border of the vaginant laminae; it is often of only one cell in places and present only on the lower portion of the vaginant laminae. The costa is often not quite percurrent, but the leaf always ends in an elongate clear cell. The shorter inconspicuous border distinguishes it from all forms of *F. elegans;* the larger costa and border on the upper leaves other than the perichaetial, from *F. Garberi;* the narrower border and truncate-rounded dorsal lamina, from *F. Ravenelii*.

## 29. **Fissidens muriculatus** Spruce; Mitt. Jour. Linn. Soc. **12**: 593. 1869.

*Fissidens diplodus* Mitt. Jour. Linn. Soc. **12**: 589. 1869. (*Spruce 475.*)
*Fissidens corticola* Schimp; Besch. Ann. Sci. Nat. VI. **3**: 191. 1876.

Plants loosely cespitose; stems red at base, 5–8 mm. long, with leaves at base small and distant; leaves in many pairs, less than 1 mm. long, narrowly oblong to linear-lanceolate, the margins plane, unbordered, crenulate by projecting cell-angles, the costa nearly or quite percurrent; vaginant laminae very unequal, extending to the middle of the leaf or beyond; dorsal lamina ending abruptly at or near the base; perichaetial leaves up to 1 mm. long, their vaginant laminae bordered by 2–3 rows of elongate, rather wide cells; leaf-cells irregularly hexagonal, mostly with a single large sharp papilla, small, about 5–7 $\mu$, larger toward the base, obscure; monoicous; antheridial buds axillary on short branches; sporophyte terminal; seta nearly 2 mm. long, often bent at base; capsule oblong, nearly or quite symmetric (so far as known), erect or inclined, small; peristome-teeth in the type imperfect because of age.

TYPE LOCALITY: Rio Negro, São Gabriel, Amazon Basin (*Spruce 473;* type seen).

DISTRIBUTION: Puerto Rico; Jamaica; probably throughout the West Indies; Guatemala (*Standley 88961a*); Brazil.

PLATE 5. *f. 63–70*.

NOTE: Much like *F. Ravenelii*, differing in the slightly shorter costa, with no marginal cells having more than a single very large papilla. In specimens from Jamaica (*Earl 122*) the capsules are symmetric, erect to inclined; urn up to 0.7 mm.; operculum rostrate; peristome-teeth up to 0.1 mm., rather stout, imperfectly forking or lacunose, longitudinally striate, strongly papillose; spores about 20 $\mu$ in diameter, warty.

The border of the perichaetial leaves is easily overlooked. Sterile *F. muriculatus* can be distinguished from *F. Donnellii* by the blunter leaves, which are more obtuse, with the dorsal lamina

more abruptly ending, and by the less sharply serrate vaginant laminae. *Moenkemeyera Richardsii* R. S. Williams; P. Richards (Kew Bull. 1934: 319) is like *F. muriculatus* except that some of the upper leaves have the vaginant laminae bordered and the papillae are large and forking (Essequibo River near Bartica, British Guiana, *Richards 118*), but the specimen from Grand Étang-Grenada, B. W. I. is merely *F. muriculatus* (*Richards 955*).

In the herbarium of the New York Botanical Garden is a specimen labeled in Mrs. Britton's handwriting "*F. Sartorii* Geheeb. & Besch. in litt." It is apparently a form of *F. muriculatus* with the leaf-papillae a little less sharply defined. The peristome-teeth are the same.

## 30. **Fissidens Neoni** (E. Bartr.) Grout, Moss Fl. N. Am. 1: 249. 1939.

*Moenkemeyera Neoni* E. Bartr. Bryologist 34: 77. 1932.

Plants minute, dull yellowish green, closely gregarious, radiculose at base, the male and female plants matted together; stems of fruiting plants about 1 mm. high, imbedded in soil; leaves 3–4 pairs, the lower very small, with vaginant laminae only, the upper abruptly larger, 0.6–0.8 mm. long, ovate to broadly lanceolate, the margins slightly crenulate, the costa percurrent or ending just below the apex; vaginant laminae extending about four-fifths the distance to the apex; dorsal lamina ending about half-way down in the broader leaves, in some of the narrower leaves reaching nearly to the insertion; perichaetial pair of leaves reaching 1 mm. in length; leaf-cells rhomboidal and hexagonal, 8–10 $\mu$ in diameter, smooth; margins of the vaginant laminae and frequently the medial margin of dorsal lamina bordered by narrowly linear cells; apical margins not bordered; sterile stems simple or branched, 3–4 mm. long, their leaves in 10–20 pairs, 0.5 × 0.8 mm. oblong-ovate, the border usually distinct on the vaginant laminae; dioicous; male plant bearing a few antheridia enclosed by 3–4 laxly areolate concave perigonial leaves, these broadly notched at the apex of the vaginant laminae; seta terminal, reddish, 2.5–3 mm. long; capsule erect, oblong-cylindric, up to 1.5 mm. long × 0.5 mm. broad, contracted under the mouth when dry; peristome-teeth 16, not divided, erect-spreading when dry, strongly incurved when moist, nearly smooth below, papillose in the upper part, not striate, fragile; calyptra very small and fugacious; operculum conic-rostrate, erect; spores minutely papillose, 20–25 $\mu$ in diameter.

TYPE LOCALITY: Vicinity of Lafeyette, Louisiana, March 30, 1931 (*Bro. Néon 885*).
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Bryologist **34**: *pl. 5*.
NOTE: This species is distinguished from *F. Ravenelii* by its smooth leaves and undivided peristome-teeth.

## 31. **Fissidens obtusifolius** Wils. Lond. Jour. Bot. 4: 196. 1845.

Plants small, fertile, 2–3 mm. high, the sterile up to 1 cm., pale green, scattered or gregarious; stems simple or sparingly branched; slender sterile shoots often present, with numerous small distant almost elliptical leaves; many shoots, both fertile and sterile, seemingly extending themselves by subapical innovations; leaves 4–8 pairs, the lower minute and distant, the upper larger (about 1 × 0.4 mm.) and crowded, oblong-lingulate, rounded-obtuse, entire, the costa ending a few cells below the apex; vaginant laminae one-half to two-thirds the length of the leaf; dorsal lamina mostly tapering, sometimes not quite reaching the stem; upper perichaetial leaves mostly faintly bordered at the very base by a few inconspicuous elongated cells; upper median leaf-cells 7–10 $\mu$ in the longest dimension, irregularly rounded-hexagonal to oblong, larger next the costa, smaller at the margin, smooth; dioicous; sporophyte terminal; seta comparatively short, 2–3 mm. long; capsule erect and symmetric, oblong-obovate, the urn 0.5 mm. or less in length, the exothecial cells shortly oblong-rectangular, collenchymatous; operculum conic-apiculate to subrostrate; divisions of peristome-teeth papillose, obscurely thickened spirally; spores 18–25 $\mu$ in diameter, maturing in autumn.

TYPE LOCALITY: Columbus, Ohio.
DISTRIBUTION: On wet rocks, often submerged at high water; New England to Minnesota, Kansas, and Colorado, south to Texas, Louisiana, Alabama, and West Virginia.
ILLUSTRATIONS: Lond. Jour. Bot. 4: *pl. 9, B;* Sull. Ic. Musc. *pl. 22;* Jennings, Mosses W. Pa. *pl. 10*.
EXSICCATI: Sull. Musci Allegh. *181;* Sull. & Lesq. Musci Bor. Am. *78;* ed. 2, *99;* Aust. Musci App. Suppl. *480;* Holz. Musci Acroc. Bor. Am. *106*.

NOTE: Probably not rare but overlooked because of its small size. Occasional plants in sods of typical character will have narrower leaves with an almost triangular apex. The faint margin at the base of the vaginant laminae is usually present but difficult of demonstration. The relationship of this species to *Semilimbidium* and to *F. exiguus* is obvious, especially when we consider var. *kansanus*.

**Fissidens obtusifolius** var. **kansanus** Ren. & Card. Bot. Gaz. 15: 40. 1890. Leaves with a broad border of elongated cells on the margins of the vaginant laminae, and a narrow less distinct border on the dorsal lamina. TYPE LOCALITY: Saline Co., Kansas (*Henry*). DISTRIBUTION: Known only from the type locality and from Cumberland Falls, Kentucky (*Welch*). NOTE: *Bartram 104* from the Patagonia Mts., southern Arizona, has the border on the vaginant laminae of the fully developed leaves but not on the dorsal lamina.

**Fissidens obtusifolius** var. **apiculatus** Grout, Moss Fl. N. Am. 1: 16. 1936. Leaves narrower in proportion to length, the upper reaching 1.4 × 0.35 mm., narrowly obtuse, mostly apiculate, the costa usually percurrent into the apiculus. TYPE LOCALITY: Bank of dry wash, Empire Mts., Pima Co., Arizona, alt. 5000 ft. (*Bartram 1187*). DISTRIBUTION: Known only from the type locality. NOTE: The size of the leaf-cells, the occasional traces of border on the margin of the vaginant laminae, and the fact that this dorsal lamina is usually attenuate and does not reach the leaf-base, indicate a close relationship to *F. obtusifolius*. Occasional leaves show papillae so faint as to be noted with extreme care only. The sporophyte is needed to settle the relationships of this plant definitely.

## 32. **Fissidens pseudoexilis** Thér. Smithson. Misc. Coll. **78**[2]: 13. 1926.

Fertile stems 2 mm. high; leaves up to 6 pairs, the lower much smaller, oblong-lanceolate, acute to apiculate, entire, the costa ending below the apex; vaginant laminae two-thirds the length of the leaf, margined with elongate cells near the base, unequal; dorsal lamina various even on the same plant, sometimes attenuate to the leaf-base, sometimes ending some distance above it; leaf-cells smooth, clear, irregularly hexagonal, 7–10 $\mu$ in the longest dimension, in the vaginant laminae becoming gradually larger toward the base, where they are rectangular, 15–20 $\mu$ long; apparently dioicous; seta pale brown, up to 4 mm. long; capsule nearly or quite erect, ovoid, about 0.5 × 0.4 mm. exclusive of the very short neck, contracted below the mouth when dry, the exothecial cells rectangular, slightly thickened at the corners; operculum short-rostrate; peristome-teeth divided about two-thirds their length, with very prominent transverse dorsal ridges at base, the forks spirally thickened and very papillose; spores smooth, 18 $\mu$ in diameter.

TYPE LOCALITY: Loma Santa Maria, Morelia, Michoacan, Mexico (*Arsène 4899, 4928*).
DISTRIBUTION: Mexico.
ILLUSTRATION: Smithson. Misc. Coll. **78**[2]: 14. *f. 10.*
NOTE: *Arsène 4928* is in much more abundant quantity and in better condition and should be regarded as the type. *Arsène 4899* contains *F. longidecurrens*. The dimorphism of which Thériot speaks is merely the result of careless observation, for leaves of both sorts are found on the same fertile plant. The relative size of the basal cells of the vaginant laminae is greatly exaggerated in the illustration.

## 33. **Fissidens Ravenelii** Sull. Mem. Am. Acad. II. 4: 171. 1849.

Plants small, 2–4 mm. high; stems simple, radiculose at base only; leaves 2–10 pairs, the upper 1 mm. or more in length, oblong-lanceolate, acute, finely crenulate by projecting cell-angles, bordered on the vaginant laminae only, the border strong, of 3 or 4 rows of cells, the costa strong, percurrent to subexcurrent in all but a few of the lower leaves; vaginant laminae about half the length of the leaf; dorsal lamina attenuate to stem; leaf-cells small, 5–7 $\mu$, irregularly quadrate to hexagonal, with about 2 papillae, obscure, most of the marginal cells having 2 marginal papillae; monoicous or dioicous, the ♂ inflorescence axillary or attached to the base of the ♀ plants by radicles; seta 3–5 mm. long; capsule oblong-ovoid, erect and symmetric, the urn 0.7–0.8 mm. long, contracted below the mouth when dry and empty, the exothecial cells collenchymatous, subquadrate to short-rectangular; operculum conic-rostrate, more than half the length of the urn; divisions of the peristome-teeth spirally thickened, papillose-roughened; spores 7–9 $\mu$ in diameter, maturing in spring.

TYPE LOCALITY: South Carolina.
DISTRIBUTION: On damp bricks, stones, or soil; North Carolina to the Gulf (frequent in Florida); West Indies; probably Mexico.
ILLUSTRATIONS: Mem. Am. Acad. II. 4: *pl. 2;* Sull. Ic. Musc. *pl. 25.*

EXSICCATI: Sull. & Lesq. Musci Bor. Am. *81;* ed. 2, *192;* Aust. Musci App. Suppl. *481;* Holz. Musci Acroc. Bor. Am. *153;* Small, Mosses S. U. S. *29;* Grout, N. Am. Musci Perf. *201.*

NOTE: The percurrent costa easily distinguishes this from *F. Donnellii* and *F. Garberi* which most resemble it. The bulging cells of the exothecium are not visible after the capsule is thoroughly soaked up.

**Section 6. Aloma** C. Müll. Gen. Musc. 61. 1901. Small, gregarious, growing on soil; leaves soft, not bordered, often more or less crenulate on the margins by projecting cell-angles; leaf-cells smooth, mostly hexagonal, translucent, usually more or less incrassate but not collenchymatous.

Vaginant laminae rarely over ⅔ length of leaf, often less.
  Plants minute, almost stemless; gametophyte about 0.5 mm. high. 34. *F. closteri.*
  Stem well developed; gametophyte 1–10 mm. high.
    Leaf-cells thin-walled, much longer than broad. 36. *F. inaequalis.*
    Leaf-cells incrassate, nearly or quite isodiametric.
      Leaves linear-lanceolate; costa shortly excurrent in most leaves.
        Leaves crenulate, shortly acuminate. 39. *F. flexinervis.*
        Leaves nearly entire, very long and slenderly acuminate. 40. *F. validicostatus.*
      Leaves oblong-lanceolate; costa ending below apex, rarely percurrent.
        Costa ending 8–10 cells below apex. 37. *F. pauperculus.*
        Costa ending 2–3 cells below apex, occasionally percurrent. 38. *F. pellucidus.*
Vaginant laminae 0.75–0.9 length of leaf. 35. *F. imbricatus.*

## 34. **Fissidens closteri** Aust. Bull. Torrey Club 5: 21. 1874.

Plants minute and almost stemless; leaves 2–3 pairs, the lower ovate with little or no dorsal lamina, the upper lanceolate from an ovate base, 0.4–0.6 mm. long, the border lacking, the margin entire or wavy above, the costa strong, ending well below the apex; vaginant laminae about half the length of the leaf; dorsal lamina narrow, not reaching the base, 3–5 cells wide; apical lamina about 3 cells wide; median cells irregularly short-rectangular, 7 × 8–18 μ, smaller at the margin; cells at lower part of vaginant laminae 10–12 × 16–32 μ; monoicous or pseudodioicous; ♂ buds attached to the ♀ plants by rhizoids or separated; antheridium single; sporophyte terminal; seta relatively stout, reaching 2 mm.; capsule oblong-ovoid, erect and symmetric, the urn about 0.4 mm. long, the exothecial cells strongly collenchymatous; calyptra covering the beak only; operculum conic-rostrate; divisions of peristome-teeth rough, spirally thickened; spores 8–12 μ in diameter.

TYPE LOCALITY: Along Anderson's and Nagle's brooks on rocks, Palisades, Closter, New Jersey (*Austin*).

DISTRIBUTION: In brown patches in crevices of decomposing rocks; Closter, New Jersey; Tiverton, Rhode Island (*Mrs. Handy*); Indiana; Puerto Rico (*Steere 5502, 6354*).

ILLUSTRATION: Sull. Ic. Musc. Suppl. *pl. 29.*

EXSICCATI: Aust. Musci App. Suppl. *479.*

NOTE: Very rare or overlooked because of its almost microscopic size. Puerto Rican plants are slightly larger than the continental.

## 35. **Fissidens imbricatus** Britt. & Bartr.; E. Bartr. Jour. Wash. Acad. 26: 7. 1936.

Plants gregarious to densely cespitose; stems 5–10 mm. high, contorted, branching, densely foliate; leaves closely imbricated, rigid, the upper narrowly lanceolate, acute, up to 2 mm. long, the costa subflexuous, percurrent, the margins crenulate by protruding cell-angles, wholly unbordered; dorsal lamina very narrow, not reaching the leaf-base; vaginant laminae reaching three-fourths to nine-tenths the length of the leaf; upper leaf-cells hexagonal, about 10 μ, turgid, smaller at margins, very smooth, larger at base, up to 16 μ, autoicous; seta geniculate, red, about 9 mm. long; capsule inclined to arcuate, asymmetric, the urn about 0.75 mm. long; operculum rostrate; peristome-teeth 0.33 mm. long, forked; spores very smooth, 10–13 μ in diameter.

TYPE LOCALITY: Schwallenburgh, St. Anne's Parish, Jamaica (*C. R. Orcutt 3942a*).

DISTRIBUTION: Jamaica.

ILLUSTRATION: Jour. Wash. Acad. 26: 7. *f. 1.*

NOTE: Bartram characterizes this species as "Similar to the rare *F. petrophilus* Sull., but differing in the curled and recurved proliferous stems, longer setae, and inclined or arcuate capsules."

Possibly this species should be placed in *Amblyothallia.*

## 36. **Fissidens inaequalis** Mitt. Jour. Linn. Soc. 12: 589. 1869.

*Conomitrium latiusculum* C. Müll. Flora 83: 328. 1897. (According to E. G. Britton.)
*Fissidens latiusculus* Paris, Index Bryol. Suppl. 160. 1900.

Plants small; stems 1–2 mm. long; leaves 2–3 pairs, the lower very small, the costa strong, percurrent; vaginant laminae less than half the length of the leaf, sharply narrowed at the upper end; dorsal lamina attenuate to the stem; perichaetial leaves oblong-lanceolate, gradually acuminate, up to 1 mm. long, entire; median leaf-cells of apical lamina oblong-hexagonal, up to 40 × 15 $\mu$, mostly smaller, the marginal narrowly subrectangular, about 7 $\mu$ wide, the basal cells gradually becoming greatly elongated, those of the dorsal lamina oblong-linear, up to 65 $\mu$ long; seta terminal, flexuous, up to 3 mm. long; capsule oblong obovate, the urn up to 0.6 mm. long, the exothecial cells quadrate or nearly so, strongly collenchymatous; operculum long-rostrate; peristome-teeth split over half their length, the forks spirally thickened, about 0.2 mm. long.

TYPE LOCALITY: Rio Negro, São Gabriel, Amazon Basin (*Spruce 538*).
DISTRIBUTION: Puerto Rico (*Steere 632, 6919*); Brazil.
PLATE 5. *f. 75–79.*
NOTE: Closely related to *F. closteri* but larger in every way and with a distinct stem.

## 37. **Fissidens pauperculus** M. A. Howe, Erythea 2: 97. 1894.

Plants minute, loosely gregarious; stems decumbent or ascending, 1.5–2 mm. long in fertile plants; leaves 3–5 pairs, small below, increasing in size upwards, the upper and the perichaetial leaves nearly or quite 1 mm. long, acute to short-acuminate, the upper oblong to obliquely spatulate, subentire to irregularly crenulate above with projecting cell-angles, the border lacking, the costa stout, vanishing well below the apex; vaginant laminae unequal, one-third to one-half the length of the leaf; dorsal lamina not reaching the leaf-base in the upper leaves; upper leaf-cells irregularly hexagonal, smaller and rounded toward the margin, larger and oblong-rectangular near the costa, those of the marginal row 7–10 $\mu$ in diameter, the others 9–16 × 16–40 $\mu$; cells of the vaginant laminae narrower and longer along the margin near the base; dioicous; seta flexuous, pale, 3–5 mm. long; capsule ovoid to oblong-ovoid, inclined to cernuous, slightly arcuate when dry, the urn 0.5 mm. long, the exothecial cells oblong-rectangular, somewhat collenchymatous, shorter near the capsule mouth; operculum conic-rostellate, nearly equaling the urn in length; annulus pale, of 2–3 rows of cells; peristome normal, the prongs spirally thickened; spores 10–14 $\mu$ in diameter, in spring.

TYPE LOCALITY: Mill Valley, Marin Co., California, on soil of moist banks with *F. limbatus* (*Howe*).
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Erythea 2: *pl. 1.*

## 38. **Fissidens pellucidus** Hornsch. Linnaea 15: 146. 1841.

*Conomitrium pellucidum* C. Müll. Syn. 2: 525. 1851.
*Conomitrium asterodontium* C. Müll. Syn. 2: 527. 1851.
*Fissidens subcrenatus* Schimp.; C. Müll. Syn. 2: 531. 1851.
*Fissidens rufulus* Sull. Proc. Am. Acad. 5: 275. 1861. Not *F. rufulus* B.S.G. 1851.
*Fissidens Wrightii* Jaeger, Enum. Fissid. 12. 1869.
*Fissidens asterodontium* Mitt. Jour. Linn. Soc. 12: 587. 1869.
*Fissidens pyrenocystis* Card. Rev. Bryol. 37: 121. 1910.

Plants annual, scattered or gregarious, usually of the same color as the red earth on which they grow; stems simple, without innovations, either erect or decumbent, from 2–3 mm. up to 5 mm. high (seldom more), stout and rufescent or ferruginous; leaves reflexed when dry, 3–8 pairs, up to 12 pairs on sterile stems, not crowded nor overlapping, increasing in size upward to 1.5 × 0.33 mm., oblong-lanceolate, acute to obtuse and usually entire, or crenate-serrulate but not bordered, the costa stout, brown, ending plainly below the apex (with few exceptions), from 27–40 $\mu$ wide, bent and somewhat flexuous above the middle; apical lamina

with only 8–12 rows of cells between vein and margin, the cells smooth, pellucid, slightly tumid, hexagonal with thick brown walls, up to 24 $\mu$ in diameter, the marginal cells smaller, up to 16 $\mu$, transversely elongate and oblong; vaginant laminae about half the length of the leaf, usually unequal, with one blade narrower than the other and ending at or near the costa at the apical junction, the cells not much larger than in the apical lamina, a few somewhat elongate next the costa at the base; dorsal lamina tapering to the base or ending abruptly; perichaetial leaves connivent, with the vaginant laminae unequally enlarged; dioicous or synoicous (?), the antheridia and archegonia terminal, usually on smaller plants with fewer leaves; seta bent at base, becoming erect, 2–5 mm. long; capsule up to 1 mm. long, the urn ovoid or cylindric, contracted below the mouth when dry, the base of the operculum and the upper walls of the urn of thickened collenchyma cells, often black around the mouth; calyptra short, covering only the long beak of the operculum; annulus falling with the operculum; peristome exserted on a short membrane, spreading when dry, strongly inrolled when moist, the teeth spirally thickened at apex; spores smooth, yellow, up to 10 $\mu$ in diameter, maturing after the rainy season

TYPE LOCALITY: Surinam.
DISTRIBUTION: Southern North America (Georgia, *Harper 1615b*) to Brazil; apparently common in the West Indies.
ILLUSTRATIONS: E. & P. Nat. Pfl. ed. 2, **10**: 149. *f. 123.* Grout, Moss Fl. N. Am. 1: *pl. 12, B.*
EXSICCATI: Sull. Musci Cub. Wright. *17.*
NOTE: The synonymy is largely that of Mrs. Britton in her notes at the New York Botanical Garden, which have been checked as carefully as material would permit.
There is considerable variation in leaf-apices, from acute to obtuse, entire to crenulate-serrate. Specimens of *F. pellucidus* determined by C. Müller were seen. There is a series of intergradations between *F. pellucidus* and *F. validicostatus*. The species to which some forms should be referred will always be a matter of personal opinion of the investigator.
*Spruce 485*, cited by Mitten (Jour. Linn. Soc. **12**: 588. 1869) as *F. flexinervis*, is this species.

## 39. **Fissidens flexinervis** Mitt. Jour. Linn. Soc. **12**: 588. 1869.

? *F. prionodes* Mont. Ann. Sci. Nat. II. **3**: 200. 1835.

Intermediate between *F. pellucidus* and *F. validicostatus;* leaves lanceolate, acuminate, crenulate, the costa excurrent, strong, flexuous; rhizautoicous, the antheridia in small basal buds.

TYPE LOCALITY: "Ad cataractam fluvii Taruma, Brazil."
DISTRIBUTION: Puerto Rico (*Steere,* 10 collections); Trinidad (*E. G. Britton, D. Coker & W. R. Rowland 1385*); Brazil; ? French Guiana; British Guiana (*Graham 371*).
PLATE 5. *f. 71–74.*
NOTE: It was Mrs. Britton's opinion that *F. prionodes* Mont. was one of these three closely related forms, probably *F. flexinervis*. I have not seen authentic material. *F. subulatus* Mitt. (Jour. Linn. Soc. 12: 389. 1869) is a similar species with long-excurrent costa.
The Spruce numbers cited by Mitten contain undoubted *F. pellucidus*, but *Spruce 493* fits Mitten's description and I have regarded it as the type; *Spruce 487* is the same thing.

## 40. **Fissidens validicostatus** Sull.; C. Müll. Linnaea **42**: 465. 1878.

Plants gregarious, small, rarely branching; fertile stems up to 1 mm. high, the sterile up to 3 mm.; leaves linear-lanceolate, gradually and evely narrowed to the slender acute apex, up to 1.5 mm. long, the margins entire to slightly crenulate, not bordered, the costa stout, sometimes somewhat flexuous; vaginant laminae very unequal, extending to a little more than one-third the length of the leaf; dorsal lamina narrow, often not reaching the stem, and often lacking in the lower leaves; apical lamina 4–8 cells wide at junction with vaginant laminae, gradually growing less toward the apex to a single cell at the base of the excurrent part of the costa; leaf-cells in apical lamina irregularly hexagonal, isodiametric to elongate, 13–23 $\mu$ in longest diameter, smaller and often quadrate on the margins, more elongate near the costa especially in the vaginant laminae, all incrassate; dioicous; seta terminal, somewhat flexuous, up to 4 mm. long; capsule oblong-ovoid, erect and symmetric, the urn about 0.6 mm. long; operculum long-rostrate, reaching 0.4 mm.; peristome normal for the genus (not fully developed in the type).

TYPE LOCALITY: Venezuela (*Fendler 13*).
DISTRIBUTION: Venezuela; also on rocks by bank of brook beside the road to Mt. Britton, Puerto Rico (*Steere & Grout*).
PLATE 6. *f. 80–85.*
NOTE: The very narrowly elongate and slender leaves are unique in the genus as far as the experience of the author goes.

**Section 7. Crenularia** C. Müll. Gen. Musc. 62. 1901. Plants small, slender; leaves not bordered, crenulate by protruding cell-angles or papillae; leaf-cells small, sometimes only 5 $\mu$ in diameter, mostly irregularly hexagonal and more or less rounded, papillose or strongly mamillose, usually with a large central papilla, rich in chlorophyll; seta terminal in all our species; peristome-teeth spirally thickened, the basal lamellae sometimes cristate. In several species 1–3 elongated marginal cells may be occasionally found on the vaginant laminae of the perichaetial leaves, but these are difficult of observation; leaves of *F. stenopteryx* are entire.

Dorsal lamina very narrow and gradually narrowed to a vanishing-point above the leaf-base. — 44. *F. stenopteryx.*
Dorsal lamina wider, reaching stem or ending abruptly.
  Papillae of leaf-cells simple.
    Costa percurrent or ending only 2–3 cells below apex at most.
      Leaf-cells only strongly mamillose. — 41. *F. cylindraceus.*
      Leaf-cells with a large sharp papilla.
        Leaves broader, linear-oblong, obtuse to acute. — 42. *F. Donnellii.*
        Leaves linear to narrowly linear-lanceolate, narrowly acute. — 47. *F. Vardei.*
    Costa clearly ending several cells below apex; papillae single.
      Leaf-cells bulging-papillose, frequent in subtropical North America. — 45. *F. radicans.*
      Leaf-cells with large blunt papilla, only two collections known. — 46. *F. Steerei.*
  Papillae of leaf-cells compound or multiple. — 43. *F. pusillissimus.*

## 41. **Fissidens cylindraceus** Mitt. Jour. Linn. Soc. 12: 590. 1869.

Stems apparently erect, up to 7 mm. long, branching apparently by innovations; leaves typically not overlapping except at or near the top of the stem, contorted when dry, up to 1.6 × 0.4 mm., oblong, acute, the margins plane, unbordered, finely and evenly crenulate throughout by projecting cell-angles, the costa usually ending 2–3 cells below the leaf-apex; vaginant laminae unequal, about half the length of the leaf; dorsal lamina about one-third the width of the leaf at base, abruptly rounded off; leaf-cells minute, 5–7 $\mu$ in diameter, irregular in size and shape, mamillose with a single blunt papilla, obscure; antheridial buds in the axils of the stem-leaves; setae terminal, sometimes 2 or 3 from a single perichaetium, about 1.5 mm. long; capsules erect and symmetric, subcylindric, attenuate into a short neck, the urn about 1 × 0.3 mm., dark red-brown when ripe (in the type), the exothecial cells rectangular, not collenchymatous; calyptra cucullate; operculum short-rostrate; peristome-teeth up to 0.24 mm., divided to the base into 2 slender forks, papillose.

TYPE LOCALITY: Mt. Chimborazo, 3000 ft. (*Spruce 475b*).
DISTRIBUTION: Orizaba, Mexico (*Murrill*); Martinique (*Duss 282*); Puerto Rico (*Steere 5305, 5493*).
PLATE 6. *f. 86–90.*
NOTE: The description is drawn from the type. The other specimens have narrower, more lanceolate leaves. The Orizaba specimen has characteristic capsules. The capsules on the Martinique specimen are not in good condition and it possibly may not be correctly identified, though the leaves match the Orizaba plant closely.

## 42. **Fissidens Donnellii** Aust. Bot. Gaz. 4: 151. 1879.

*Fissidens tenerrimus* C. Müll. Act. Soc. Fenn. **19**: 10. 1891.
*Fissidens crenatoserrulatus* Card. Rev. Bryol. **36**: 70. 1909.

Plants minute, 2–3 mm. high, decumbent, rather scattered, not branched; leaves 6–7 pairs on sterile stems, a little fewer on the fertile, crowded, overlapping, the perichaetial reaching 1.5 mm., those next below about 1 mm. long, narrowly oblong, obtuse to subacute, the margins crenulate-serrate with projecting cells, not bordered, the costa usually ending well below the apex, in cross section with 3 large central ducts and 2 narrow stereid bands; vaginant laminae rather more than half the length of the leaf, irregularly toothed on the margin; leaf-cells

irregularly hexagonal, 7–12 $\mu$ in diameter, nearly isodiametric, each cell with a single large papilla on each side except on the inner surface of the vaginant laminae; autoicous, the antheridia terminal on small basal plants, usually few and mixed with archegonia; sporophyte terminal; seta 2–4 mm. long, bent at base; capsule erect and symmetric, the urn 0.7–0.8 mm. long, the stomata in the short neck few and large, the exothecial cells oblong-rectangular, strongly collenchymatous, smaller and subquadrate in several rows below the mouth; operculum about the same length, conic-rostrate; calyptra short, covering only the beak; peristome-teeth spreading when dry, strongly incurved when moist, the divisions spirally thickened; spores 13–21 $\mu$ in diameter, in summer.

TYPE LOCALITY: On base of cypress trees, Caloosa, Florida (*John Donnell Smith & C. F. Austin 1878*).
DISTRIBUTION: Florida; West Indies; probably Mexico.
ILLUSTRATION: Jour. N. Y. Bot. Gard. **20**: *pl. 233.*
EXSICCATI: Holz. Musci Acroc. Bor. Am. *465.*
NOTE: Mrs. Britton (Jour. N. Y. Bot. Gard. **20**: 138–142. 1919) has numerous interesting notes on this species. The irregularly toothed vaginant laminae differentiate this and *F. Vardei* from all others. See also note under *F. muriculatus.*

## 43. **Fissidens pusillissimus** Steere, Ann. Bryol. **10**: 116. 1938.

Plants exceedingly small, always less than 2 mm. high, usually about 1 mm.; stems simple, erect when moist, somewhat decurved ventrally when dry; leaves 4–7 pairs, inrolled, slightly shrunken and ventrally falcate-crispate when dry, but not strongly distorted, up to 0.7 × 0.09–0.10 mm., the lower smaller, the upper oblong-lanceolate, all rounded-obtuse, the costa stout, rather suddenly and strongly bent at a wide angle at about the leaf-middle, ending abruptly well below the leaf-apex; vaginant laminae reaching half the length of the leaf, unequal in width only; dorsal lamina ending gradually or abruptly at the stem; leaf-cells small, obscure, pleuripapillate, the upper median ones nearly isodiametric, up to 5.5 $\mu$ in diameter, quadrate to hexagonal, the marginal ones transversely elongate, 7.5 $\mu$ × 5.5 $\mu$, with two marginal papillae on the truncate outer surface, the extreme basal cells smooth and somewhat elongated; dioicous; male organs not found; sporophyte terminal; seta yellow, becoming darker with age, straight, 2 mm. long; capsule erect, symmetric, the urn 0.4 mm. long, less than 0.25 mm. wide, the exothecial cells very strongly convex-swollen and collenchymatous; operculum conic, long-rostrate, about two-thirds the length of the urn.

TYPE LOCALITY: On bark of tree with *Pireella cymbifolia* (Sull.) Card. on bank of Subin River, Belize District, British Honduras (*P. Gentle 1833a*).
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Ann. Bryol. **10**: 118. *f. 1–7.*

## 44. **Fissidens stenopteryx** Besch. Rev. Bryol. **18**: 54. 1891.

Plants more or less gregarious, pale green or brown when old; stems erect, slender and straight, often 2 or 3 together arising from old prostrate stems, seldom more than 5 × 1 mm., usually simple or branching by apical innovations; leaves up to 22 pairs, incurved and twisted when dry, spreading when moist, crowded and overlapping at base, the broader vaginant laminae fitting into the vacant space left by the shorter and narrower dorsal lamina, about 0.66–0.90 × 0.16 mm., lanceolate, the margins entire or obscurely serrulate with truncate or bicuspidate smooth cells up to 5 $\mu$ in diameter, the cells next the costa larger, up to 8 $\mu$, the costa paler, clear and straight below, often bent at the junction of the vaginant laminae and more or less sinuous above the junction, ending below the 3–4 larger smooth cells of the acute apex; apical cells all hexagonal and dense with thick walls and minute obscure papillae, about 14 rows between costa and margin; vaginant laminae scarcely longer but broader than the apical, ending evenly and obliquely at junction, the cells longer and broader, the basal juxtacostal cells sometimes up to 13 × 8 $\mu$, minutely papillose on the outer surface; dorsal lamina becoming much narrower below the middle of the leaf and tapering to one row of cells or lacking at the base of the leaf; rhizautoicous or autoicous, the antheridia either terminal on

tall plants or axillary on the ♀ plant in small buds with 2–4 minute bracts and without paraphyses; vaginule dark brown, 0.33 mm. long; seta 0.8–1 mm. long, often bent at base; capsules obovoid-cylindric, ± 0.8 mm. long, contracted under the mouth when dry, the exothecial cells subquadrate to rectangular, collenchymatous; calyptra extending below the mouth of the capsule, split at base; operculum short-rostrate; peristome-teeth strongly and sharply papillose, inflexed when dry or moist; spores smooth, 15–20 $\mu$ in diameter.

TYPE LOCALITY: Border of the Duplessis River, Guadeloupe (*Edouard Marie 518*).
DISTRIBUTION: Guadeloupe; Puerto Rico (*Steere*).
PLATE 7. *f. 91–99.*
NOTE: Absolutely no trace of a border has been found on the type specimens! The sporophyte is described from Puerto Rican specimens.

## 45. **Fissidens radicans** Mont. Ann. Soc. Nat. II. 14: 345. 1840.

*Fissidens santa-clarensis* var. *obtusifolius* Bizot & Thér.; Thér. Mem. Soc. Cub. Hist. Nat. **13**: 210. 1939.

Distinguished from *F. Donnellii* as follows: plants as a rule a little larger, more often branching by innovations; leaves narrowly oblong and of nearly uniform width until near the obtuse apex; leaf-cells more regular, smaller, rarely over 8 $\mu$ in diameter, less angular, mamillose-bulging rather than papillose, the marginal cells smaller and less acute, not more strongly crenulate on the vaginant laminae than near the apex; sporophyte terminal or occasionally on a short lateral branch.

TYPE LOCALITY: French Guiana.
DISTRIBUTION: Southern United States to South America; Puerto Rico.
ILLUSTRATION: Grout, Moss Fl. N. Am. 1: *pl. 122.*
NOTE: The illustrations of the leaves of *F. Donnellii* (Jour. N. Y. Bot. Gard. **20**: *pl. 233*) have almost exactly the outline of *F. radicans*. Most of the leaves of *F. Donnellii* are gradually narrowed above and acute, as Mrs. Britton described them. In *F. radicans* the leaves are of a nearly uniform width until they are usually but not always abruptly "pinched off" to a narrower obtuse apex. However, the much more coarsely toothed vaginant laminae of *F. Donnellii*, especially on the perichaetial leaves, is well shown in figure 6 of the plate cited. *F. santa-clarensis* var. *oblusifolius* seems to be only a large form of *F. radicans*. Plants from Yucatan identified by both Steere and myself as *F. radicans* are as large as those described by Thériot.

## 46. **Fissidens Steerei** Grout, sp. nov.*

Stems slender, delicate, up to 2–3 mm. high; leaves up to 12 pairs, mostly 8 or fewer, distant, not overlapping except at the apex of the stem, up to 0.8 × 0.3 mm., shortly oblong-lanceolate to oblong-ovate, obtuse to broadly acute, crenulate by projecting cells, the costa ending well below the apex; vaginant laminae up to two-thirds the length of the leaf; dorsal lamina wide, rounded to the stem at base; leaf-cells in apical lamina up to 10 $\mu$, irregularly hexagonal, each with a single large blunt papilla on each face, the basal cells a little larger; sex organs and sporophyte not seen.

TYPE: Yucatan, *Steere 1539* (at Duke University; isotype at University of Michigan).
DISTRIBUTION: Yucatan, Mexico, Guatemala (*Steyermark 32913*).
PLATE 7. *f. 100–104.*
NOTE: Closely resembles in appearance *F. pusillissimus* Steere, but is larger in every way and has only one large papilla on each cell surface. Differs from *F. radicans* in its much smaller size, distant and relatively broader leaves with vaginant laminae fully two-thirds the length of the leaf. In the type the juxta-costal leaf-cells are noticeably larger, but the plants from Guatemala do not show this. Most of the *Crenulariae* or sterile *Semilimbidia* that resemble this have multiple or compound papillae.

## 47. **Fissidens Vardei** Thér. Mem. Soc. Cub. Hist. Nat. 13: 208. 1939.

Plants minute, 0.4 mm. high; stems very short, simple, or aggregate from red rhizoids; leaves 3–6 pairs, 1–2 mm. long, linear-lanceolate, narrowly acute, not bordered, occasionally with a few elongate cells near the edge of the vaginant laminae of the perichaetial leaves, the

* **Fissidens Steerei**; caulis tenuis, simplex aut innovationibus ramosus; folia 8–12 juga attingentia, 1 cm. alta, remota, breviter oblongo-lanceolata aut oblongo-ovata, 0.8 × 0.3 mm. aut minus, crenulata; duplicatura ⅔ folii attingens; lamina dorsalis lata, ad basim folii attingens, obtusa; cellulae laminae apicalis circa 10 $\mu$ prave hexagonales, quisque cum papilla magna.

margins sharply crenulate by projecting cell-angles, those of the vaginant laminae of the perichaetial leaves coarsely serrate, the costa ending below the apex; dorsal lamina narrow below but reaching base; upper leaf-cells clear, hexagonal with a single large, sharp, central papilla; cells of vaginant laminae of perichaetial leaves larger, oblong to rectangular; dioicous or pseudautoicous; seta erect or bent at base, 2–5 mm. long; capsule very small, less than 0.5 mm., erect and symmetric, the exothecial cells quadrate to short-rectangular, strongly collenchymatous, the neck with stomata; peristome light red, incurved, split unequally nearly to base, the forks slender, spirally thickened; spores 8–10 $\mu$ in diameter, smooth.

TYPE LOCALITY: On soil, Pico Turquino, Cuba (*Acuña 119*).

DISTRIBUTION: Cuba; Jamaica (*Taylor 1180, Harris 10031*); Puerto Rico (*Steere 5848*); Guatemala (*Bernoulli 1180*).

ILLUSTRATION: Mem. Soc. Cub. Hist. Nat. **13**: *pl. 31, f. 6a–6d.* PLATE 7. *f. 105–111.*

NOTE: Description quoted with slight changes from Mrs. Britton's notes. A very distinct and striking species, most closely allied to *F. Donnellii*. A marked characteristic of both is the strongly serrate vaginant laminae. Although the type has not been seen, *F. Vardei* Thér. is so strongly characterized that there is no mistaking its identity with the Jamaican and Puerto Rican plants. Leaves broadly obtuse.

**Section 8. Amblyothallia** C. Müll. Gen. Musc. 63. 1901. Plants of medium size, usually with rather long stems; leaves stiff, long and narrow, ligulate to lingulate, obtuse or acute, strongly curved to one side when dry, unbordered throughout, entire or serrulate at apex, sometimes crenulate above; leaf-cells smooth, small, rounded, more or less obscure; sporophyte terminal; peristome usually papillose.

| | |
|---|---|
| Leaves broadly obtuse. | |
| Leaves ligulate-oblong. | 48. *F. asplenioides.* |
| Leaves oblong-lingulate, never apiculate; vaginant laminae ⅔–¾ length of leaf. | 49. *F. lingulatus.* |
| Leaves sharply to broadly acute. | |
| Leaves sharply acute. | 50. *F. similiretis.* |
| Many leaves obtusely acute. | 50a. *F. similiretis* var. *guadalupensis.* |

## 48. **Fissidens asplenioides** Hedw. Sp. Musc. 156. 1801.

*Dicranum asplenioides* Sw. Fl. Ind. Occ. **3**: 1770. 1806.
*Skitophyllum asplenioides* Pylaie, Jour. de Bot. Desv. II. **4**: 156. 1814.
*Fissidens flabellatus* Hornsch. in Mart. Fl. Bras. 1²: 91. 1840. (According to Fleischer.)
*Fissidens turbinatus* Tayl. Lond. Jour. Bot. **7**: 190. 1848.
*Fissidens ligulatus* Hook. f. & Wils.; Hook. f. Fl. Nov. Zeland. **2**: 63. 1854.
*Fissidens nigricans* Schimp.; Besch. Ann. Sci. Nat. VI. **3**: 192. 1876.
*Fissidens barbae-montis* C. Müll.; Ren. & Card. Bull. Soc. Bot. Belg. **31**¹: 152. 1893. (According to E. G. Britton.)
*Fissidens costaricensis* Besch. Bull. Herb. Boiss. **2**: 390. 1894. (According to E. G. Britton.)
*Fissidens linguaefolius* C. Müll. in Ule, Bryoth. Brasil. 120. 1898. (According to Fleischer.)
*Fissidens santa-clarensis* Thér. Mem. Soc. Cub. Hist. Nat. **13**: 209. 1939.

Plants bright green to yellowish, ascending to erect, the sterile plants up to 5 cm. (according to Fleischer), the fertile about 1 cm., mostly simple; leaves much broken below, 15 or more pairs, close or overlapping, ligulate-lingulate, recurved in one direction even when moistened, 2–2.5 × 0.33–0.4 mm., rounded-obtuse with often a slight apiculus, the margins plane, unbordered, and finely crenulate above by projecting cell-angles, the costa ending many cells below the apex, strongly bent at junction with vaginant laminae, more or less flexuous above; vaginant laminae unequal, one rounded nearly to the costa, extending beyond the middle of the leaf; dorsal lamina usually rather wide and ending abruptly before reaching the stem; upper leaf-cells incrassate, often highly mamillose, 5–7 $\mu$ in diameter, irregular in size and shape, transversely elongate on the margins, the basal cells and a row near the costa larger, subquadrate, 10–14 $\mu$; dioicous; antheridia terminal; seta 5–8 mm. long; capsule oblong-cylindric, erect to horizontal, the urn up to 1.5 mm.; operculum rostrate, as long as the urn; annulus present; peristome-forks long and slender, papillose in more or less oblique lines.

TYPE LOCALITY: On mossy rocks of high mountains, Jamaica.

DISTRIBUTION: Moist shaded rocks in elevated regions; West Indies; Central and South America; Sumatra; New Zealand; Tasmania; Africa; Java.

ILLUSTRATIONS: Hedw. Descr. **3**: *pl. 28;* Mart. Fl. Bras. 1²: *pl. 2, II;* Jour. de Bot. Desv. II. **4**: *pl. 38, f. 8, 9.* PLATE 8. *f. 112–120.*

EXSICCATI: Pringle, Musci Mex. *10,503.*

NOTE: A cotype of *F. nigricans* Schimp. is but a depauperate and dark-colored form of this species. *F. lingulatus* C. Müll. has shorter, broader leaves that are never apiculate, almost semicircular at apex, sometimes almost emarginate. *F. santa-clarensis* is a form of *F. asplenioides* with a narrower, more acute apex varying toward *F. similiretis*. (Cuba, *Eckman 2583, Léon & Clement 6479.*)

## 49. **Fissidens lingulatus** C. Müll. Bull. Herb. Boiss. **5**: 172. 1897.

? *Fissidens gracilifrondeus* C. Müll. Bull. Herb. Boiss. **5**: 172. 1897.

Plants large, up to 1.5 cm.; leaves up to 20 pairs, lingulate, over 2 × 0.7 mm., rounded-obtuse, sometimes almost indented at apex, entire or very slightly crenulate at apex, the costa ending well below the apex, flexuous; vaginant laminae up to three-fourths the length of the leaf, not united above, the free one rounded-obtuse to the costa; dorsal lamina wide, ending abruptly at or near the stem; leaf-cells mamillose, irregularly rounded, 7–10 $\mu$, larger near the costa and at base, smaller on the margins; capsule oblong-cylindraceous from an appreciable neck, erect, somewhat curved when dry; operculum long-rostrate.

TYPE LOCALITY: Guatemala, Cuesta de Atitlan (*Bernouilli & Cario 115*).

DISTRIBUTION: Guatemala; Mexico (*Frye 3035, 3037.*)

NOTE: Gametophyte described from specimens identified by Mrs. Britton from Vera Cruz. Mexico; description of sporophyte translated from the original. The differences between *F. lingulatus* and *F. gracilifrondeus* seem insignificant.

The original spelling *linguatus* is regarded as a typographic error.

## 50. **Fissidens similiretis** Sull. Proc. Am. Acad. **5**: 274. 1861.

*Fissidens firmiusculus* Besch. Rev. Bryol. **18**: 50. 1891. (Isotype seen.)
*Fissidens Helleri* Ren. & Card. Bull. Soc. Bot. Belg. **41**[1]: 49. 1905.

Plants up to 1–2 cm. high, dark green, often muddy and old and worn; stems simple or branching by lateral apical innovations, usually about 5–10 mm. long, stout, more or less flexuous; leaves crowded, overlapping, recurved above the middle when dry, 10–20 or even 30 pairs, about 2–2.5 × 0.25 mm., lanceolate, acuminate, the margins not bordered, crenulate-serrulate, more sharply serrate at the apex, the costa ending just below the apex, bent at the end of the vaginant laminae and more or less flexuous, clear, occasionally forking or branching at the apex; cells of apical lamina rounded or hexagonal, 5–10 $\mu$ in diameter, mamillose on both sides except on border; vaginant laminae two-thirds the length of the leaf, three times as wide as the dorsal lamina, sometimes unequal, the cells somewhat irregular, largest toward the costa, 13–18 $\mu$ in diameter; dorsal lamina ending abruptly at or above the base; perichaetial leaves often shorter and narrower; dioicous or autoicous; antheridia terminal, few, without paraphyses, with 2 small constricted bracts; vaginule large; seta stout, 3–4 mm. long, geniculate; capsule ovoid or cylindric, 5 mm. long, the walls collenchymatous, its cells about 27 $\mu$ in diameter; calyptra covering only the beak; operculum rostrate; peristome red, strongly incurved, the teeth striate below, the apex spirally thickened; spores brown, up to 18 $\mu$ in diameter, maturing in summer.

TYPE LOCALITY: "On cliffs among mountains" of Cuba (isotype seen).

DISTRIBUTION: The Bahama Islands; Banao Hills, Cuba; Bayamón, Puerto Rico (*Heller 4933*) to Guadeloupe.

PLATE 8. *f. 121–126.*

NOTE: *F. firmiusculus* Besch. is a form with nearly entire leaves!

**Fissidens similiretis** var. **guadalupensis** (Schimp.) Grout, comb. nov. ? *Fissidens martinicae* Besch. Ann. Sci. Nat. VI. **3**: 192. 1876. *Fissidens guadalupensis* Schimp.; Besch. Ann. Sci. Nat. VI. **3**: 193. 1876. *Fissidens laxobasis* Bizot & Thér.; Thér. Mem. Soc. Cub. Hist. Nat. **13**: 209. 1939. Intermediate between *F. asplenioides* and *F. similiretis*, the costa more nearly percurrent than in the former, the leaf-apex less acute than in the latter. TYPE LOCALITY: Guadeloupe, "sur les pierres dans la rivière Rouge, 1025 m. altit. (Husnot, *Exsicc.*, no. 134)." DISTRIBUTION: With the species.

**Section 9. Serridium** C. Müll. Gen. Musc. 67. 1901. Plants of large to medium size; leaves unbordered, in most species serrate, at least above; leaf-cells smooth to mamillose; seta mostly lateral (except *F. osmundioides, F. Littlei,* and *F. Hallii*).

Costa percurrent or nearly so (except *F. osmundioides*); cells of costa all long and narrow.
Leaf-margins finely and evenly crenulate by projecting cell-angles, or serrate at apex.
Plants medium-sized, crenulate on most of the margin.
Sporophyte lateral.
Costa slender, nearly or quite percurrent. 51. *F. Bushii.*
Costa stout, typically shortly excurrent. 58. *F. taxifolius.*
Sporophyte terminal.
Costa nearly percurrent to excurrent.
Peristome-teeth forked. 52. *F. Hallii.*
Peristome-teeth not divided. 53. *F. Littlei.*
Costa ending several cells below apex; peristome-teeth forked. 54. *F. osmundioides.*
Plants very large; leaves toothed at apex only. 55. *F. Oerstedianus.*
Leaves entire, rarely with slightly irregular apical margins. 56. *F. polypodioides.*
Costa ending several cells below leaf-apex; costa covered above with short mamillose cells. 57. *F. subbasilaris.*

## 51. **Fissidens Bushii** (Card. & Thér.) Card. & Thér. Bot. Gaz. **37**: 365. 1904.

*Fissidens subbasilaris* var. *Bushii* Card. & Thér. Bot. Gaz. **30**: 16. 1900.

Plants smaller than *F. cristatus;* leaves oblong, rounded-obtuse and apiculate to broadly acute, finely and evenly crenulate-serrate, without lighter border, the costa slender, nearly or quite percurrent, pellucid; upper median leaf-cells 7–10 $\mu$ in diameter; sporophyte lateral from near the base of the plant; seta 6 mm. or more long; capsule ovoid, the urn about 1.2 mm. long; operculum rostrate, a little shorter; divisions of the peristome-teeth appendiculate.

TYPE LOCALITY: Eagle Rock, Missouri.
DISTRIBUTION: Owen Sound, Ontario; N. Carolina; near Easton, Pennsylvania (*Small*); Thomasville, Georgia; Vermont.
ILLUSTRATIONS: Bot. Gaz. **37**: *pl. 17, f. 2a–2d;* Grout, Moss Fl. N. Am. **1**: *pl. 12, C.*
EXSICCATI: Macoun, Can. Musci *767, 768.*
NOTE: Distinguished from small forms of *F. taxifolius* by the more slender costa, barely or not quite percurrent; from *F. subbasilaris* by the evenly crenulate margin, percurrent costa, pellucid and of linear cells; from *F. osmundioides* by the smaller leaf-cells and lateral sporophyte. It is nearest to *F. cristatus* var. *winonensis* but distinguished by the entire lack of lighter border and by the finely and regularly crenulate upper margin.

## 52. **Fissidens Hallii** Aust. Bot. Gaz. **2**: 97. 1877.

*Fissidens Austini* Barnes, Bot. Gaz. **12**: 32. 1887.

Plants small, 2–4 mm. high; leaves 4–8 pairs, narrowly oblong, acute, the upper and perichaetial largest, reaching 1.5 mm. in length, finely and regularly crenulate on the upper margin, smooth, the costa pale, subpercurrent; vaginant laminae serrulate, half the length of the leaf, with narrower elongated cells at base; dorsal lamina tapering to leaf-base; upper median leaf-cells not incrassate, rounded-hexagonal to subquadrate, 7–10 $\mu$ in diameter; dioicous; sporophyte terminal; seta 2–3 mm. long; capsule obovoid, erect and symmetric, the urn 0.5–0.75 mm. long, the exothecial cells not incrassate, oblong-rectangular, with largest dimension longitudinal at base, transverse in the middle, several rows of smaller hexagonal cells below the mouth; operculum long-rostrate, a little shorter than the urn; divisions of the peristome-teeth papillose and spirally thickened; spores in spring.

TYPE LOCALITY: Texas (*Hall*).
DISTRIBUTION: On bark of trees and logs in damp places; Florida (*Rapp, Grout*); Texas.
ILLUSTRATION: Grout, Moss Fl. N. Am. **1**: *pl. 12, A.*
EXSICCATI: Holz. Musci Acroc. Bor. Am. *409* (as *F. falcatulus*).
NOTE: The plant described above is not rare in certain parts of Florida and is a good species, almost certainly *F. Hallii* Aust. It seems doubtful if there is enough of a border to put this in *Semilimbidium.*

## 53. **Fissidens Littlei** (R. S. Williams) Grout, Moss Fl. N. Am. **1**: 249. 1939.

*Moenkemeyera Littlei* R. S. Williams, Bryologist **39**: 40. 30 S 1936.
*Fissidens Orcutti* Grout, Moss Fl. N. Am. **1**: 20. 23 O 1936.

Plants small, in thin close wide mats over clay soil, 1.5–2 mm. high; leaves 6–11 pairs, smaller at base of stem and spaced, the upper overlapping, reaching 1.25 mm. long, oblong-

lanceolate, acute to apiculate, not bordered, crenulate along the entire margin by projecting cell-angles, the costa strong, flexuous, percurrent, subexcurrent in the apiculate leaves; dorsal lamina gradually very attenuate, usually reaching the stem; vaginant laminae unequal, about half the length of the leaf in the upper and perichaetial leaves, narrowed at the junction with the wider apical lamina, giving the leaves a characteristic incurved outline on the ventral margin; upper leaf-cells irregularly hexagonal, 7–12 $\mu$ in longest dimension, smaller at the margin, larger near the costa, somewhat bulging; basal cells of vaginant lamina somewhat larger; dioicous; male plants smaller, with 2 or 3 pairs of leaves; seta terminal, over 3 mm. long, apparently flexuous (but specimen immature); capsule (immature) apparently erect and symmetric, obovoid, about 0.5 mm. long, the exothecial cells quadrate to short-rectangular, collenchymatous and rounded at the corners; operculum conic-rostrate; peristome-teeth undivided, from a short basal membrane, warty-papillose; spores about 8 $\mu$, maturing from winter to spring.

TYPE LOCALITY: Vertical shaded walls of gypsum sink, 2–4 feet below the general surface of gypsum deposits a mile or so north of Middle Well, alt. 4200 ft., New Mexico (*E. L. Little 108*).
DISTRIBUTION: Middle Well, New Mexico; New Orleans, Louisiana (*Orcutt*); Trinidad (*E. G. Britton, D. Coker & W. R. Rowland 748, 841*).
ILLUSTRATION: Bryologist **39**: *pl. 4;* Grout, Moss Fl. N. Am. **1**: *pl. 13, B.*
NOTE: Differs from *F. osmundioides* in smaller size, narrower leaves, attenuate dorsal lamina, and percurrent costa. When sterile extremely difficult to differentiate from *F. Hallii.*

## 54. **Fissidens osmundioides** Hedw. Sp. Musc. 153. 1801.

*Fissidens dicarpos* Brid. Bryol. Univ. **2**: 698. 1827.

Plants of medium size, 1–3 (rarely 8–10) cm. high, in rather close mats, in more or less close tufts with brown rhizoids at base, olive to dark green; stems erect, simple or sparingly branched; leaves numerous, close and slightly overlapping, the upper often larger, 1–2 × 9.5 mm., cultriform to lingulate or oblong-lanceolate, rounded-obtuse and often apiculate to broadly acute, finely and evenly crenulate above with projecting cell-angles, without border, the costa ending a little below the apex; vaginant laminae one-half to two-thirds the length of the leaf, unequal, narrowed in the upper and perichaetial leaves to meet the apical lamina; dorsal lamina usually ending abruptly at the nondecurrent base; upper median leaf-cells irregularly hexagonal, bulging, 12–20 $\mu$, the marginal smaller; dioicous; sporophyte terminal; seta 5–10 mm. long; capsule erect and symmetric, chestnut-brown, oblong-obovoid, the urn reaching 1.8 mm. in length, the exothecial cells irregular and very incrassate; calyptra many-lobed at base; operculum needle-beaked, nearly as long as the urn; divisions of the peristome-teeth not spirally thickened but nodulose and marked with very fine longitudinal lines between the nodes; spores 18–25 $\mu$, finely papillose, maturing from summer to autumn.

TYPE LOCALITY: Europe.
DISTRIBUTION: On moist shaded soil, widely distributed in eastern North America and apparently common in the cooler portions; Yukon to Newfoundland and northward, south to Vancouver Id., Idaho, Missouri, Ohio, North Carolina, and Tennessee.
ILLUSTRATIONS: Bryol. Eur. *pl. 103;* Braithw. Brit. Moss Fl. **1**: *pl. 11, A;* Hedw. Sp. Musc. *pl. 40, f. 7–11.*
EXSICCATI: Drummond, Musci Am. *112;* Sull. Musci Allegh. *179;* Sull. & Lesq. Musci Bor. Am. *86,* ed. 2, *109;* Aust. Musci App. *104;* Grout, N. Am. Musci Perf. *190;* Holz. Musci Acroc. Bor. Am. *35;* Macoun, Can. Musci *63.*
NOTE: Spores from Cape Breton were ripe in July, while in Ontario they were ripe in November.

## 55. **Fissidens Oerstedianus** C. Müll. Syn. **2**: 529. 1851.

Plants growing on trees, much branched, up to 10 cm.; leafy stems 7 mm. wide; leaves 4 × 1 mm., acute, plainly denticulate at apex; laminae and leaf-cells as in *F. polypodioides;* capsule oblong-subcylindric, horizontal.

TYPE LOCALITY: Costa Rica (*Oersted*).
DISTRIBUTION: Costa Rica.

## 56. **Fissidens polypodioides** Hedw. Sp. Musc. 154. 1801.

Plants large, 2–5 cm. long, gregarious, yellowish-green; stems simple or branching from the base, rooting at base only, erect to ascending; leaves numerous, barely overlapping, about

3 mm. long, oblong-lingulate, rounded-obtuse with a short blunt apiculus, or rarely subacute, entire, not bordered, sometimes slightly denticulate at apex, the costa strong, almost percurrent; vaginant laminae half the length of the leaf or more; dorsal lamina wide, extending to the base of the leaf, truncate; leaf-cells irregularly hexagonal, pellucid, smooth, the upper median 10–15 $\mu$, larger near the costa and much smaller at the margin; dioicous; sporophyte from the upper leaf-axils, sometimes subterminal; seta about 1 cm. long; capsule elongated-obconic or subpyriform, contracted under the mouth when dry and empty; operculum rostrate, half the length of the urn; annulus large, revoluble; divisions of the peristome-teeth nodulose.

TYPE LOCALITY: Jamaica.

DISTRIBUTION: On moist shaded banks and ledges; Georgia, Alabama, Louisiana, and Florida; Fern, Indiana (*Underwood*); West Indies; Mexico; Central and South America.

ILLUSTRATIONS: Hedw. Descr. *pl. 27;* Sull. Ic. Musc. *pl. 27.*

EXSICCATI: Drummond, So. Mosses *38;* Sull. & Lesq. Musci Bor. Am. *87,* ed. 2, *110;* Small, Mosses S. U. S. *9.*

NOTE: Mostly sterile in the United States but easily recognized by its large size and lingulate entire leaves. Sullivant's figures show the leaves too acute for most of our plants.

## 57. **Fissidens subbasilaris** Hedw. Sp. Musc. 155. 1801.

Plants small, 5–10 mm. high, scattered to closely gregarious, erect or ascending; stems simple or branching; leaves 10–18 pairs, somewhat crispate when dry, close and overlapping, reaching 1–1.5 mm. in length, oblong, obtuse, or subacute and apiculate by a projecting cell, those in the middle of the stem usually the largest, minutely and evenly crenulate below by projecting cell-angles, minutely and irregularly serrulate above by larger cells, without border, the costa strong, covered and obscured with mamillose cells in the upper part, ending several cells below the apex; vaginant laminae reaching about half the length of the leaf; dorsal lamina usually ending abruptly before or after reaching the stem; leaf-cells rather obscure, 7–10 $\mu$ in the upper middle of the leaf, strongly and bluntly mamillose on both sides, irregularly rounded-hexagonal, incrassate, larger and less obscure in the base of the vaginant laminae; dioicous; sporophyte arising from a leaf-axil near base of stem; seta 3–5 mm. long, reaching about to the top of the stem; capsule oblong-cylindric, erect and symmetric or slightly curved, brown, the urn rather more than 1 mm. long, the exothecial cells scarcely collenchymatous; operculum conic-rostrate, about half the length of the urn; peristome-teeth nodulose above, not spirally thickened or papillose; spores 16–18 $\mu$ in diameter, maturing in autumn.

TYPE LOCALITY: Near Lancaster, Pennsylvania (*Muhlenberg*).

DISTRIBUTION: On soil, stones, and base of trees; Ontario and Connecticut, southward to the Gulf east of the Mississippi; common on bases of trees in Florida, but fruiting sparingly.

ILLUSTRATIONS: Hedw. Sp. Musc. *pl. 39, f. 6–9;* Sull. Ic. Musc. *pl. 26;* Jennings, Mosses W. Pa. *pl. 12;* Grout, Moss Fl. N. Am. 1: *pl. 7, C.*

EXSICCATI: Drummond, So. Mosses *42;* Sull. Musci Allegh. *184;* Sull. & Lesq. Musci Bor. Am. *84,* ed. 2, *107;* Aust. Musci App. *105;* Holz. Musci Acroc. Bor. Am. *466;* Grout, N. Am. Musci Perf. *285;* Small, Mosses S. U. S. *16* (as *F. decipiens*).

NOTE: When sterile it may be confused with *F. Donnellii,* but in that species the mamillae are more like large papillae, the leaves are finely and evenly crenulate to the very apex, and the dorsal lamina ends less abruptly. *F. cristatus* has the costa plainly percurrent and of elongated cells at the apex, and in most leaves the lighter border is very apparent.

## 58. **Fissidens taxifolius** Hedw. Sp. Musc. 155. 1801.

Plants light green, darker with age, 5–20 mm. high; stems rather stout, sparingly branched from the base; leaves close, overlapping, in many pairs, largest in the middle of the stem, ± 2 mm. long, oblong-cultriform, rounded-obtuse and apiculate to subacute, finely and evenly crenulate above with projecting cell-angles, the costa strong, in well developed mature plants excurrent into a short mucro, in lower leaves and on depauperate or undeveloped plants often merely percurrent; vaginant laminae one-half to two-thirds the length of the leaf; dorsal lamina ending abruptly, usually reaching the stem; upper median leaf-cells 7–10 $\mu$, bulging-mamillose, smaller and often somewhat lighter-colored at the margins, larger near the costa; perichaetial leaves often with terminal and dorsal lamina narrow, linear or sword-shaped, or almost lacking; ♂ buds on short branches rooting at base; sporophyte axillary near the base; seta 8–15 mm. long, ascending, flexuous; capsule oblong, contracted under the mouth when dry, the urn ± 1.5 mm. long, somewhat inclined to nearly pendulous, mostly somewhat

curved and asymmetric, the exothecial cells oblong to subquadrate, incrassate, with many rows of smaller very incrassate isodiametric cells below the mouth; calyptra covering nearly half the urn, split on one side; operculum conic, long, obliquely rostrate, the beak fully the length of the urn; peristome-teeth deep red, the divisions strongly nodulose and marked with very fine oblique lines between the nodes; spores 15–20 $\mu$ in diameter, maturing from November to March.

TYPE LOCALITY: Europe.

DISTRIBUTION: On damp shaded soil; Canada and the eastern United States, south to central Florida and Missouri; Carr Peak, Huachuca Mts., Arizona (*Goodding*).

ILLUSTRATIONS: Bryol. Eur. *pl. 104;* Hedw. Sp. Musc. *pl. 39, f. 1–5;* Braithw. Brit. Moss-Fl. **1**: *pl. 12, A;* Jennings, Mosses W. Pa. *pl. 11.*

EXSICCATI: Sull. & Lesq. Musci Bor. Am. *83,* ed. 2, *106;* Aust. Musci App. *107;* Holz. Musci Acroc. Bor. Am. *177, 467;* Grout, N. Am. Musci Perf. *173.*

NOTE: Young sterile shoots sometimes approach *F. osmundioides* in leaf characters, but in that species the costa in most leaves ends several cells below the apex. From all forms of *F. cristatus* and *F. adiantoides* it is easily separated by the evenly crenulate upper margin scarcely lighter in color. Some European plants (e.g. Cardot, Musci Eur. *116*) have the costa much more strongly excurrent than in most American plants, but specimens from Sweden (comm. Möller) match the American plants almost perfectly.

**Section 10. Marginatus** Grout, sect. nov.* *Serridium* C. Müll. Gen. Musc. 67, in part. 1901. Leaves serrulate to crenulate, especially at apex, bordered by cells of a different color or texture but little if at all elongated; border-cells sometimes of more than one layer.

Margin of only one layer of cells.
  Marginal cells merely different in color, sometimes lighter.
    Leaf-cells 6–10 $\mu$. 59. *F. cristatus.*
    Leaf-cells up to 15 $\mu$. 60. *F. adiantoides.*
  Marginal cells more incrassate and darker.
    Costa percurrent; leaves distantly and coarsely serrate above; border of vaginant laminae distantly and irregularly toothed. 61. *F. austro-adiantoides.*
    Costa percurrent to excurrent; leaves finely serrate and acutely apiculate at apex, finely, sharply and regularly crenulate-serrulate on vaginant laminae. 62. *F. Bourgaeanus.*
Margin bistratose. 63. *F. incrassatolimbatus.*

## 59. **Fissidens cristatus** Wilson; Mitt. & Wils. Jour. Bot. & Kew Misc. **9**: 294. 1857.

? *Fissidens dubius* Beauv. Prodr. Aeth. 57. 1805.
? *Skitophyllum adiantoides* var. *marginatum* Pylaie, Jour. de Bot. Desv. II. 4: 163. 1814.
*Fissidens circinans* Schimp.; C. Müll. Bot. Zeit. **22**: 340. 1864.
*Fissidens decipiens* De-Not. Comm. Soc. Critt. Ital. **2**: 98. 1865.
*Fissidens rupestris* Wilson; Jaeger, Enum. Fissid. 25. 1869. (Nomen nudum.)
*Fissidens floridanus* Lesq. & James, Proc. Am. Acad. **14**: 137. 1879.
*Fissidens collinus* Mitt. Jour. Linn. Soc. **21**: 559. 1885. (According to Paris.)

Plants in rather close dark green sods 1–3 cm. high; leaves numerous, overlapping, 1.5–2.5 mm. long, oblong-lingulate to oblong-lanceolate, acute to rounded and subapiculate, bordered by a band of lighter-colored cells, irregularly crenulate-serrate above, the costa percurrent or nearly so; vaginant laminae about half the length of the leaf; leaf-cells irregularly hexagonal, bulging-mamillose, 6–10 $\mu$, a few 12 $\mu$, bistratose in places; perichaetial leaves broadly ovate with a very small and narrow dorsal and apical lamina; dioicous; sporophyte lateral; seta 1–4 mm. long; capsule inclined to horizontal, oblong, narrowed to the seta, the urn 1–1.5 mm. long, the exothecial cells incrassate, oblong to quadrate or hexagonal; operculum long-rostrate, nearly as long as the urn; divisions of peristome-teeth strongly trabeculate with fine longitudinal and oblique lines between the nodes below, appendiculate and finely papillose at the top; spores 10–15 $\mu$ in diameter, maturing from late autumn to winter.

TYPE LOCALITY: Khasia Mountains, India.

DISTRIBUTION: On moist shaded soil and stones, occasionally on the base of trees; eastern North America from Nova Scotia to the Gulf of Mexico, west to the Rocky Mountains; in all the continents of the Northern Hemisphere.

ILLUSTRATIONS: Braithw. Brit. Moss-Fl. 1: *pl. 11, D;* Jennings, Mosses W. Pa. *pl. 11.*

EXSICCATI: Drummond, Musci Am. *110* (as *F. adiantoides*); Drummond, So. Mosses *41;* Sull. & Lesq. Musci Bor. Am. *85* (as *F. adiantoides*); Holz. Musci Acroc. Bor. Am. *34, 81, 391;* Grout, N. Am. Musci Perf. *6.*

* **Marginatus**; folia plus minusve valde serrata apicem versus, anguste marginata cellulis colore inter reliquas differentibus.

NOTE: In this species, and more frequently in *F. adiantoides*, plants occur with the pale border faint or lacking, but the irregularly crenulate-serrate apex distinguishes both from all but *F. subbasilaris* even when sterile, and that species has the costa ending several cells below the leaf-apex and also mamillose-roughened on the surface.

Mr. H. N. Dixon thinks that without doubt *F. cristatus* Wilson is the same as *F. decipiens* De-Not.; he adds that Fleischer concurred in this opinion. He examined also authentic specimens of *F. floridanus* Lesq. & James (*Dr. Garber 39*) in the Kew herbarium and writes that "it is exactly our *F. decipiens* or *F. cristatus*, a rather small form." Mrs. Britton (Bryologist 8: 49. 1905) states that *F. dubius* Beauv. and *S. adiantoides* var. *marginatum* Pylaie are all based on the same plants collected in America by Beauvois, but without record of the locality. It is probable that *F. dubius* Beauv. is the proper name for this plant, but Dr. Pierre Allorge writes that the type is not in the Paris Museum.

**Fissidens cristatus** var. **winonensis** (Ren. & Card.) Grout, Moss Fl. N. Am. **1**: 22. 1936. *Fissidens decipiens* var. *winonensis* Ren. & Card. Bot. Gaz. **22**: 50. 1896. Smaller; leaves smaller and narrower, the pellucid border most often indistinct, and the areolation less opaque. TYPE LOCALITY: Winona, Minnesota. DISTRIBUTION: Probably with the species in eastern United States. EXSICCATI: Holz. Mosses Minn. *6*. NOTE: What appears to be a portion of the type collection has been seen. The costa ends a cell or two below the apex. It differs from *F. subbasilaris* in the longer smooth costa; from *F. Bushii* in the irregularly crenulate-serrulate apex. Specimens from Ft. Worth, Texas, and near Columbus, Ohio, have been seen.

## 60. **Fissidens adiantoides*** Hedw. Sp. Musc. 157. 1801.

*Fissidens majus* Mitt. Jour. Linn. Soc. **21**: 559. 1885. (According to Paris.)
*Fissidens adiantoides* var. *immarginatus* Barnes, Bot. Gaz. **12**: 27. 1887.

Typically larger than *F. cristatus* with border less distinct or lacking (var. *immarginatus* Barnes); upper median leaf-cells 15 $\mu$ or larger; often difficult to distinguish.

TYPE LOCALITY: Europe.
DISTRIBUTION: In much the same habitats as *F. cristatus;* Cape Breton Island to Vancouver Island, south to California and Florida.
ILLUSTRATIONS: Bryol. Eur. *pl. 105;* Braithw. Brit. Moss-Fl. **1**: *pl. 12, B.*
EXSICCATI: Aust. Musci App. *106;* Grout, N. Am. Musci Perf. *124.*
NOTE: Size is no decisive distinction between this and the preceding; neither is the inflorescence, for each may be either monoicous or dioicous. Both species vary greatly in height and width of fronds.
The size of the leaf-cells seems the only reliable distinction and there are many intermediate forms.

**Fissidens adiantoides** var. **semicristatus** Grout, Moss Fl. N. Am. **1**: 21. 1936. Plants large; leaf-border scarcely visible; leaf-cells intermediate between this and *F. cristatus,* 10–12 $\mu$, occasionally reaching 15 $\mu$. TYPE LOCALITY: Near Lake Worth, Florida. DISTRIBUTION: Florida. NOTE: Similar forms of a smaller size are found farther north.

## 61. **Fissidens austro-adiantoides** C. Müll. Bull. Herb. Boiss. **5**: 547. 1897.

Plants large; stems 5–10 cm. long; leaves close, somewhat overlapping, about 4 × 1 mm., oblong, acute, the costa percurrent or nearly so, bordered by larger oblong cells which cover the surface of the costa in the lower part of the leaf; vaginant laminae unequal, about half the length of the leaf, irregularly or distantly and faintly toothed; dorsal lamina wide, truncate, not always reaching the leaf-base, the apex distantly and rather regularly toothed; leaf-cells 7–15 $\mu$ in longest diameter, more incrassate and darker-colored on the margin, forming a distinct border 2–4 cells wide; sporophyte unknown; archegonial buds in the axils of the leaves.

TYPE LOCALITY: Jamaica.
DISTRIBUTION: Jamaica (*Underwood 717*); Guatemala (*Standley 89819*).
PLATE 9. *f. 127, 128.*

## 62. **Fissidens Bourgaeanus** Besch. Mem. Soc. Sci. Nat. Cherbourg **16**: 170. 1872.

Stems 5–8 cm. long, sparingly branched; leaves close, overlapping, rarely reaching 2 mm. in length, about 0.8 mm. wide, oblong-lanceolate and often apiculate by the excurrent costa, serrulate at apex, the costa stout, flexuous, percurrent to excurrent, not surfaced by short-oblong cells; vaginant laminae unequal, less than half the length of the leaf, finely, evenly, and sharply crenulate-serrate on the margin; dorsal lamina wide, truncate, not always quite reaching the leaf-base; leaf-cells much as in *F. austro-adiantoides* but the juxta-costal not so

* Hedwig's spelling was *adianthoides*. Since *adiantoides* was used earlier by Linnaeus and subsequently by almost all who wrote on mosses, the present writer thinks it preferable to regard Hedwig's spelling as an "orthographic error" and to retain the accepted version.

much larger, the marginal well defined; dioicous; archegonial buds axillary; sporophyte unknown.

TYPE LOCALITY: "In valle Cordovensis," Mexico.
DISTRIBUTION: Mexico.
PLATE 9. *f. 129–132*.

### 63. **Fissidens incrassatolimbatus** Card. Rev. Bryol. 27: 119. 1910.

Very similar to *F. polypodioides* in habit, size, and fruit, but the leaves everywhere incrassate-bordered and for the most part serrate at the acute apex; border 2-layered; distinguished from *F. Bourgaeanus* by the more robust habit and the larger leaves, which are twice as long and three times as wide; dorsal lamina truncate at base.

TYPE LOCALITY: Guatemala, Alta Vera Paz, "in silva primaeva prope Coban" (*H. von Türckheim*, 1908).
DISTRIBUTION: Guatemala.
PLATE 9. *f. 133, 134*.
NOTE: The author does not mention the 2-layered border, but this is very evident in a portion of the type at the New York Botanical Garden, and is mentioned by Brotherus (in E. & P. Nat. Pfl. ed. 2, **10**: 152. 1924). This is the only reliable diagnostic difference between *F. Bourgaeanus* and *F. incrassatolimbatus* that I have been able to observe. It is very probably a synonym of one of the species mentioned in the same group by Brotherus. In microscopic characters it does not in the least resemble *F. polypodioides*.

**Section 11. Pachyfissidens** C. Müll. Syn. **1**: 45. 1849. Plants large, aquatic or subaquatic, stiff and rigid; stems without central strand; leaves bi- or tri-stratose except at margins; costa merging into the thickened lamina, vanishing in or near the apex; leaf-margins nearly or quite entire, not bordered (except in *F. rochensis*); sporophyte lateral, rarely produced; capsules without stomata; peristome well developed.

Leaves not bordered.
  Leaves acute; margins sharply crenulate-serrate to base of vaginant laminae. 64. *F. diversiretis*.
  Leaves acute to obtuse; margin entire or erose. 65. *F. grandifrons*.
Leaves bordered. 66. *F. rochensis*.

### 64. **Fissidens diversiretis** Broth.; Hand.-Mazz. Symb. Sin. 4: 11. 1929.

Plants in wide, dark green mats in running water, branching near base only; stems up to 5 cm. or more in length, lenticular in section, without central strand, up to 2.5 mm. wide including leaves; leaves somewhat secund at the end of stems and branches when dry, 2.5 × 0.5 mm., ligulate-lanceolate, acute, serrulate at apex, crenulate on the rest of the plane margins by projecting cell-angles, the costa ending 2–4 cells below the leaf-apex, in cross section with dorsiventral band of guides extending up the ventral side of the leaf and two lateral stereid bands; vaginant laminae extending only slightly beyond the leaf-middle, unequal, 2–4-stratose except near margins; dorsal lamina rather wide, extending to stem and ending abruptly; leaf-cells smooth, clear, those of the apical lamina incrassate, rounded-hexagonal to subquadrate, 8–15 $\mu$ in longest dimension, smaller near the margins; sex organs and sporophyte unknown.

TYPE LOCALITY: Northwestern Yunnan, "in einem kleinen Wasserfall in der trockenen str. St. ober Ngaiwa am Mekong, 27° 30′, kristallinisches Gestein, 1850 M."
DISTRIBUTION: Running water at brink of falls, Cañon del Templar, region of the Río de Bavispe, northeastern Sonora, Mexico, alt. 7500 ft. (*E. A. Phillips 614*).
PLATE 10. *f. 135–139*.
EXSICCATI: Zahlbr. Krypt. Exs. Mus. Vind. *2972* (isotype).
NOTE: The isotype cited is larger than the Mexican plants collected by Phillips, the leaves reaching 5 mm. in length. The description is from the Mexican specimens. The species differs from *F. grandifrons* in the shorter vaginant laminae, the cross section of the costa, the acute, serrulate leaf-apex, and the crenulate leaf-margin.

### 65. **Fissidens grandifrons** Brid. Musc. Recent. Suppl. 1: 170. 1806.

*Fissidens insignis* Schimp.; C. Müll. Bot. Zeit. **22**: 339. 1864.
*Fissidens grandifrons* var. *strictus* Besch. Mem. Soc. Sci. Nat. Cherbourg **16**: 171. 1872.

Plants large, 3–15 cm. long, the fronds 3–4 mm. wide, dark green, often dark brown and lime-encrusted below, much divided and branched, especially near the base, rigid and suberect; leaves numerous, crowded and overlapping, rigid and opaque, of equal length, 2–3 mm., linear-lanceolate, narrowly obtuse, entire, not bordered, the costa strong, vanishing in the apex; vaginant laminae more than half the length of the leaf; dorsal lamina tapering gradually to the base; leaf-cells in one layer at the margin, in several at the costa, irregularly hexagonal, 7–12 $\mu$ in diameter; dioicous; sporophyte lateral from the upper leaf-axils, rarely produced; seta up to 1.5 cm. long; capsule erect and symmetric or nearly so, oblong, the urn about 1.2 mm. long; operculum conic-rostrate, about 1 mm. long; peristome-teeth deeply inserted, the divisions rough; spores 15–24 $\mu$ in diameter.

TYPE LOCALITY: "Nova Anglia."

DISTRIBUTION: On wet rocks in trickling water or submerged in streams in limestone regions, apparently frequent but local; southern Canada, Alberta to Ontario, Washington to California, east to New York, West Virginia, and Tennessee; Mexico; Europe, Asia, Africa, and probably South America.

ILLUSTRATIONS: Bryol. Eur. *pl. 106*.

EXSICCATI: Sull. Musci Allegh. *186;* Sull. & Lesq. Musci Bor. Am. *88*, ed. *2*, *111;* Aust. Musci App. Suppl. *483;* Holz. Musci Acroc. Bor. Am. *135*.

NOTE: In an isotype of *F. grandifrons* var. *strictus* Besch. the leaves are gradually narrowed above to the acute apex. A specimen from herb. Broth. in the N. Y. Botanical Garden, labeled "*F. planiusculus* Besch. in litt.," from Japan, and a specimen in the U. S. Nat. Herb. scarcely differ from the ordinary form of *F. grandifrons* except in the apex which is gradually narrowed and acute.

## 66. **Fissidens rochensis** Broth. Symb. Ant. **3**: 421. 1903.

Plants smaller and more slender than in *F. grandifrons*, cespitose in dense rigid cushions, dark green, not glossy; stems up to 1.5 cm. long, fuscous-radiculose at base, mostly simple; leaves rigid, many pairs, not changed in drying, 1.1–1.3 mm. long, about 0.25 mm. wide, narrowly oblong-lanceolate, broadly acute, nearly or quite entire, bordered almost to the apex by long narrow cells, the costa strong, vanishing below the apex; vaginant laminae unequal, about half the length of the leaf; dorsal lamina narrow, reaching the stem, not bordered below; apical lamina of at least two layers of cells except at the margins; leaf-cells minute, 5–6 $\mu$, incrassate, irregular and rounded, smooth; other characters unknown.

TYPE LOCALITY: Guadeloupe, in Roche Creek on rocks, alt. 680 m. (*Duss 116;* isotype seen at N. Y. Bot. Gard.).

DISTRIBUTION: Guadeloupe; Jamaica (*Nichols 14*); Puerto Rico (*E. G. Britton & Delia Marble 485*); Dominica (*F. E. Lloyd*).

PLATE 10. *f. 140–144*.

**Section 12. Octodiceras** Mitt. Jour. Linn. Soc. **12**: 581. 1869; Brid. Musc. Recent. Suppl. **1**: 162 (as genus). 1806. Plants slender, aquatic, long, soft, and floating; central strand lacking; seta shorter or little longer than the perichaetial leaves; stomata lacking.

Plants rarely over 4 cm. long; seta longer than the capsule. 67. *F. Hallianus*.
Plants 5–15 cm. long; habit of *Fontinalis*.
  Seta shorter than capsule; peristome-teeth truncate. 68. *F. debilis*.
  Seta longer than capsule; peristome-teeth forked and slender-pointed. 69. *F. manateensis*.

## 67. **Fissidens Hallianus** (Sull. & Lesq.) Mitt. Jour. Linn. Soc. **21**: 560. 1885.

*Conomitrium Hallianum* Sull. & Lesq. in Aust. Musci App. *108b*. 1870.
*Octodiceras Hallianum* Jaeger, Ber. St. Gall. Nat. Ges. **1874–75**: 136. 1876.

Similar to *F. debilis* or *F. manateensis*, but much smaller and more slender, 3–4 cm. long; seta several times longer than the capsule; peristome-teeth undivided, papillose in fine lines.

TYPE LOCALITY: On decayed wood in a well, Athens, Illinois (*Hall*).*

DISTRIBUTION: Submerged on stones and logs, New Jersey, New York, Illinois, Idaho (*Leiberg*).

ILLUSTRATIONS: Sull. Ic. Musc. Suppl. *pl. 28*.

EXSICCATI: Leiberg, Musci Leib. *120;* Aust. Musci App. *108b*.

NOTE: J. D. Smith's Florida plants, referred to this species for over fifty years, have well developed forked teeth and belong to *F. manateensis*. Leiberg's plants from Idaho are sterile; the leaves are very narrow, the upper about 0.15 mm. wide and reaching 3 mm. long; in the larger leaves the vaginant laminae are from one-tenth to one-eighth the length of the leaf. They may be a different species.

* One specimen bears the label: "On base of *Cephalanthus* in sunken holes at Athens, Illinois."

## 68. **Fissidens debilis** Schwaegr. Suppl. 1²: 11. 1816.

*Skitophyllum fontanum* Pylaie, Jour. de Bot. Desv. II, 4: 158. 1814. Not *Fissidens fontanus* Schimp. 1859.
*Fontinalis ? juliana* Savi, Bot. Etrusc. 3: 107. 1818.
*Octodiceras julianum* Brid. Bryol. Univ. 2: 678. 1827.
*Conomitrium julianum* Mont. Ann. Sci. Nat. II. 8: 246. 1837.
*Fissidens julianus* Schimp. Flora 21: 271. 1838.
*Octodiceras fontanum* Lindb. Bidr. Moss. Syn. 23. 1863.
*Conomitrium mexicanum* Schimp.; C. Müll. Bot. Zeit. 22: 347. 1864.
*Fissidens mexicanus* Mitt. Jour. Linn. Soc. 12: 584. 1869.
*Conomitrium Türckheimi* C. Müll. Bull. Herb. Boiss. 5: 173. 1897.
*Octodiceras julianum* var. *ohioense* Emig, Bryologist 21: 60. 1918.

Plants long, slender, and floating, with the habit of *Fontinalis*, 5–15 cm. long, flaccid, blackish green below; stems filiform, branching by innovations along the whole length; leaves distant, spreading, numerous, reaching 3–6 mm. in length, linear-lanceolate, entire, broadly acute, without border, the costa vanishing some distance below the apex; vaginant laminae about one-third to one-fourth the length of the leaf; dorsal lamina usually not reaching the base; upper median leaf-cells irregularly hexagonal, inclining to quadrate below, 14–24 $\mu$ in longest dimension, larger near the costa, much smaller at the margins, thin-walled; monoicous, the ♂ and ♀ inflorescences terminating short axillary branches; seta shorter than the capsule; capsule elliptic, the urn about 0.5 mm.; operculum fully as long as the urn, conic-rostrate; peristome-teeth truncate, irregularly cleft and perforate above, papillose; spores 18–21 $\mu$, maturing in summer.

TYPE LOCALITY: Europe.
DISTRIBUTION: Submerged on stones and logs; Washington, Michigan, Ontario, and Vermont, south to California, Arizona, and Florida; also in South America and Europe.
ILLUSTRATIONS: Bryol. Eur. *pl. 108;* Limpr. Laubm. 1: 458. *f. 145;* Jour. de Bot. Desv. II. 4: *pl. 34, f. 2.*
EXSICCATI: Drummond, So. Mosses (as *F. semicompletus*); Sull. & Lesq. Musci Bor. Am. *89*, ed. 2, *112;* Aust. Musci App. *187;* Holz. Musci Acroc. Bor. Am. *265, 335;* Ren. & Card. Musc. Am. Sept. Exs. *16b;* E. Bartr. Mosses S. Ariz. *11.*
NOTE: Varies in slenderness and in the width and distance apart of the leaves; frequent but fruiting sparingly. Pringle, Pl. Mex. *10576*, determined by Cardot as *Fissidens mexicanus*, is apparently this species. Types of *F. mexicanus* and *C. Türckheimi* were not seen but the descriptions fit *F. debilis* or *F. manateensis* (the sporophyte was not described for either). In an aquatic moss the characters mentioned for var. *ohioense* do not seem worthy of varietal rank.

## 69. **Fissidens manateensis** Grout in Holz. Musci Acroc. Bor. Am. *590.* 1926.

Very similar to *F. debilis* and difficult to distinguish when sterile; leaves averaging smaller and narrower; dorsal lamina ending less abruptly and usually more nearly reaching the stem; cells just above the vaginant laminae 15–21 $\mu$, irregularly subquadrate to hexagonal; perichaetial leaves longer than those below, several times as long as the capsule and seta; monoicous; male flowers terminating short axillary branches bearing bract-like leaves; seta terminal at the end of a main branch, 1–3 mm. long, plainly longer than the capsule; capsule obovoid; operculum long-conic; peristome-teeth deeply cleft, the divisions long, slender, and obliquely striate above; spores about 15 $\mu$ in diameter, maturing in early spring.

TYPE LOCALITY: Near the road from Oneco to Arcadia, Manatee Co., Florida.
DISTRIBUTION: On logs in water, Florida.
ILLUSTRATIONS: Bryologist 31: *pl. 3;* Grout, Moss Fl. N. Am. 1: *pl. 4, A; 12, D.*
NOTE: The spores were not ripe in most capsules collected and in some of the unripe capsules the teeth were not fully developed, but they were not truncate, and in fully ripened capsules the teeth were perfect. Probably common in peninsular Florida but rarely fruiting and confused with *F. debilis*. *F. Berterii* Mont. from Chile is similar in capsule and peristome but the leaves are much less attenuate and the costa shorter.

### DOUBTFUL AND EXCLUDED SPECIES

Owing largely to current conditions material of the following species was unavailable; the descriptions do not clearly indicate their relationship. They are said to enter the range of the Flora.

*Conomitrium psatyrocheilon* Schlieph. Bot. Zeit. **13**: 424. 1855.
*Conomitrium crassicolle* Besch. Rev. Bryol. **18**: 51. 1891.
*Conomitrium papulans* Besch. Rev. Bryol. **18**: 51. 1891.
*Conomitrium excavatum* Besch. Rev. Bryol. **18**: 52. 1891.
*Fissidens flavifrons* Besch. Rev. Bryol. **18**: 54. 1891.
*Fissidens juruensis* Broth. Hedwigia **45**: 264. 1906.
*Fissidens Sancta-Crucis* Broth. in E. & P. Nat. Pfl ed. 2. **10**: 146. 1924. (Nomen nudum.)
*Fissidens conostegus* C. Müll.; Broth. in E. & P. Nat. Pfl. ed. 2. **10**: 146. 1924. (Nomen nudum.)

## PLATE 1

Figs. 1–7. *Fissidens Brittonii* Grout.

Fig. 1. Plants. × ⅔. Fig. 2. Plant. × 3⅓. Fig. 3. Leaves: *a*, *b*, lower; *c*, perichaetial. × 20. Fig. 4. Leaf-apex. × 200. Fig. 5. Leaf-margin: *a*, basal; *b*, medial. × 200. Fig. 6. Capsules. × 13⅓. Fig. 7. Exothecial cells. × 200.

Figs. 8–10. *Fissidens dissitifolius* Sull.

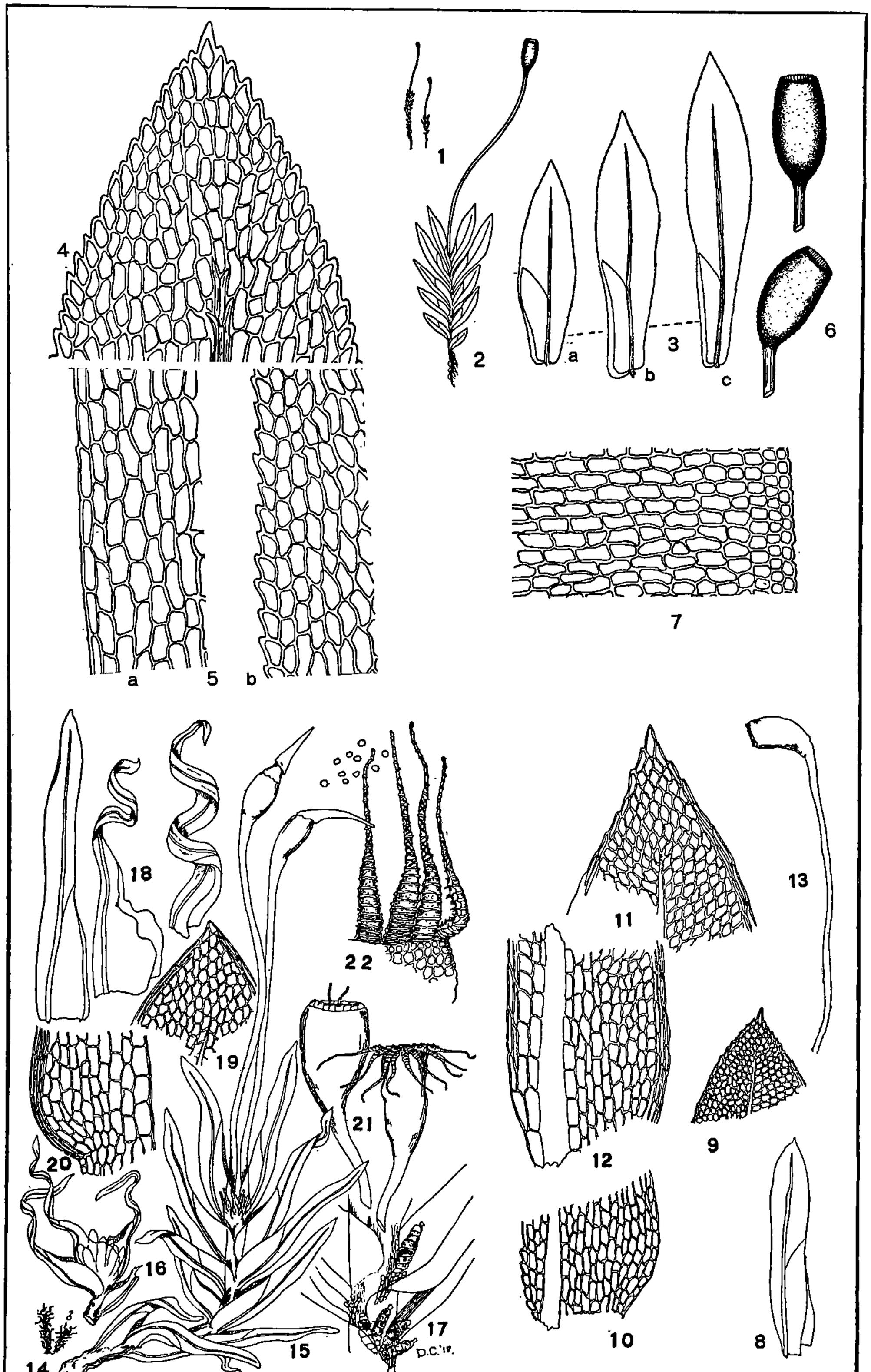
Fig. 8. Leaf. × 15. Fig. 9. Leaf-apex. × 45. Fig. 10. Basal cells. × 60.

Figs. 11–13. *Fissidens reticulosus* (C. Müll.) Mitt.

Fig. 11. Leaf-apex. × 75. Fig. 12. Basal cells. × 62. Fig. 13. Capsule and part of seta. × 10.

Figs. 14–22. *Fissidens mollis* Mitt.

Fig. 14. Plant. × ½. Fig. 15. Archegonial plant. × 5. Fig. 16. Antheridial plant. × 5. Fig. 17. Brood bodies. Fig. 18. Leaves. × 10. Fig. 19. Leaf-apex. × 80. Fig. 20. Basal cells. × 80. Fig. 21. Capsules. × 15. 22. Part of peristome.




FISSIDENS

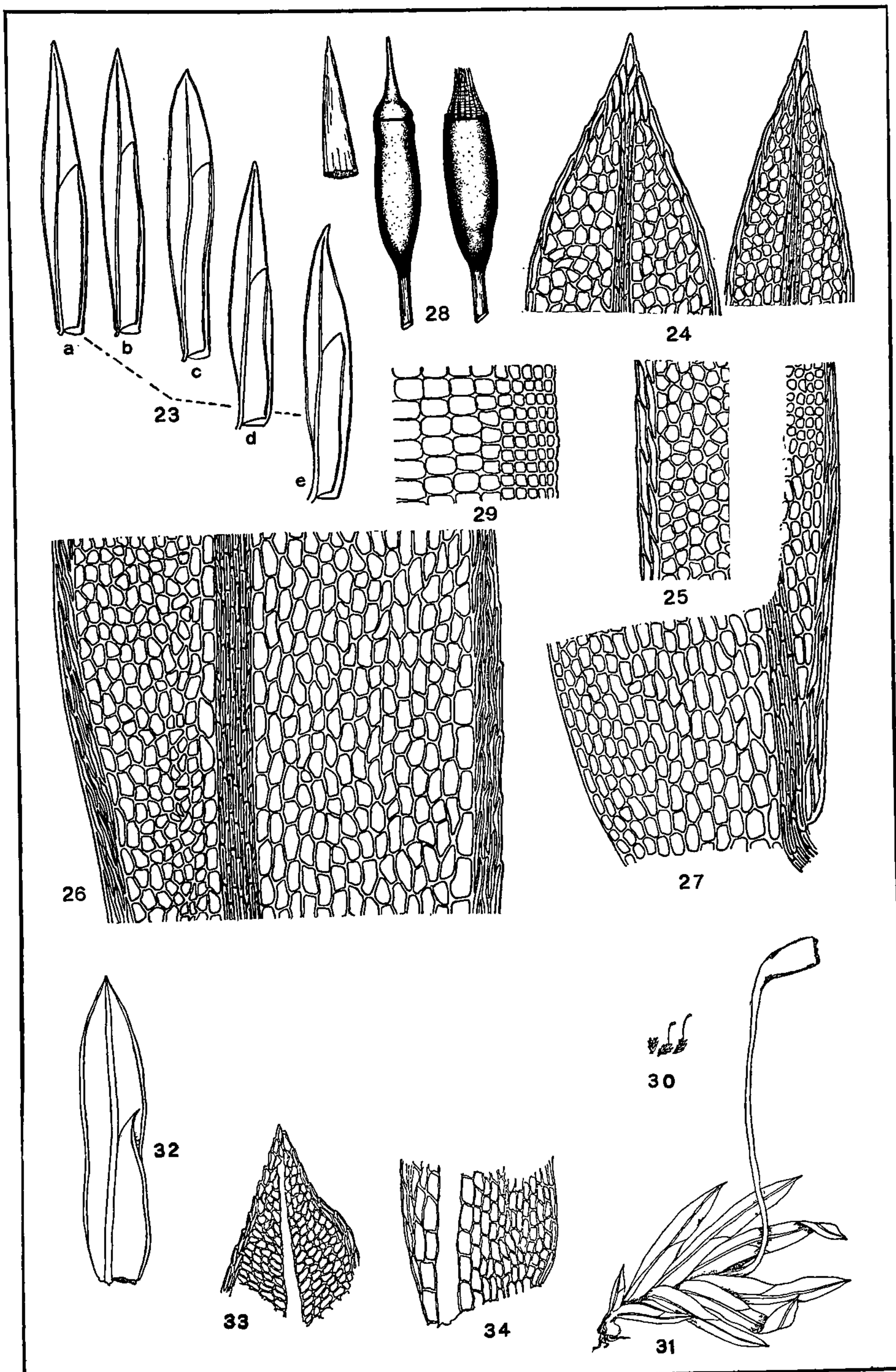
## Plate 2

Figs. 23–29. *Fissidens angustifolius* Sull.

Fig. 23. Leaves: *a–e,* upper to lower respectively. × 20. Fig. 24. Leaf-apices. × 200. Fig. 25. Margin of vaginant lamina. × 200. Fig. 26. Part of lower leaf with vaginant lamina. × 200. Fig. 27. Basal cells. × 200. Fig. 28. Capsules and calyptra. × 13⅓. Fig. 29. Exothecial cells. × 200.

Figs. 30–34. *Fissidens palmatus* (Sw.) Hedw.

Fig. 30. Plants. × ½. Fig. 31. Plant with sporophyte. × 10. Fig. 32. Leaf. × 25. Fig. 33. Leaf-apex. × 60. Fig. 34. Basal cells. × 100.




FISSIDENS

## Plate 3

Figs. 35–40. *Fissidens Steyermarkii* E. Bartr.

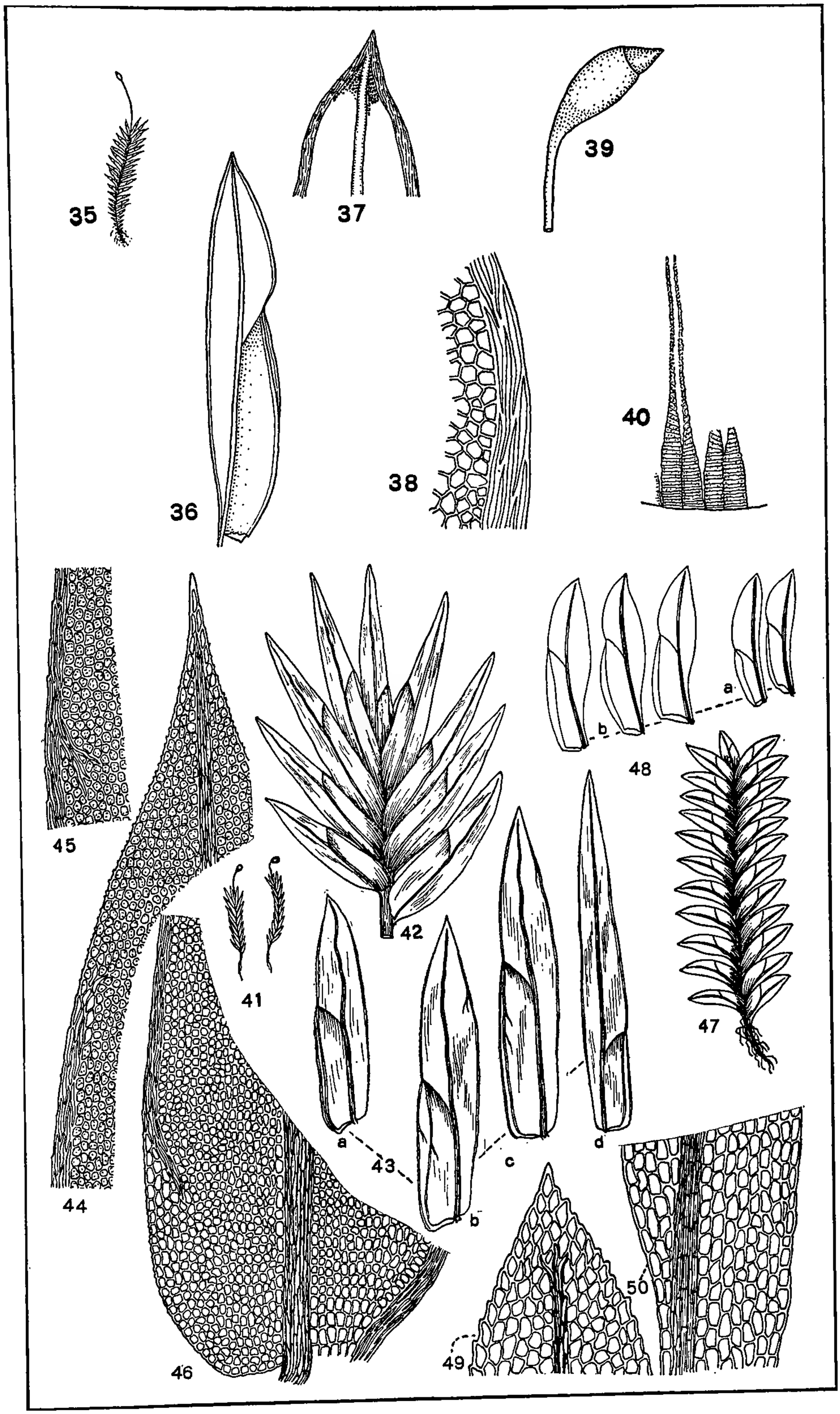
Fig. 35. Plant. × 1. Fig. 36. Leaf. × 15. Fig. 37. Leaf-apex. × 80. Fig. 38. Leaf-margin and cells of upper part of leaf. × 220. Fig. 39. Capsule. × 10. Fig. 40. Part of peristome. × 80.

Figs. 41–46. *Fissidens Weiri* Mitt.

Fig. 41. Plants. × 2⅔. Fig. 42. Part of plant. × 13⅓. Fig. 43. Leaves: *a*, lower; *b*, middle; *c*, upper; *d*, perichaetial. × 20. Fig. 44. Leaf-apex and upper margin. × 200. Fig. 45. Medial margin. × 200. Fig. 46. Base of dorsal lamina. × 200.

Figs. 47–50. *Fissidens arcticus* Bryhn.

Fig. 47. Plant. × 13⅓. Fig. 48. Leaves: *a*, lower; *b*, upper. × 20. Fig. 49. Leaf-apex. × 200. Fig. 50. Basal cells. × 200.




FISSIDENS

## Plate 4

Figs. 51–54. *Fissidens densiretis* Sull.

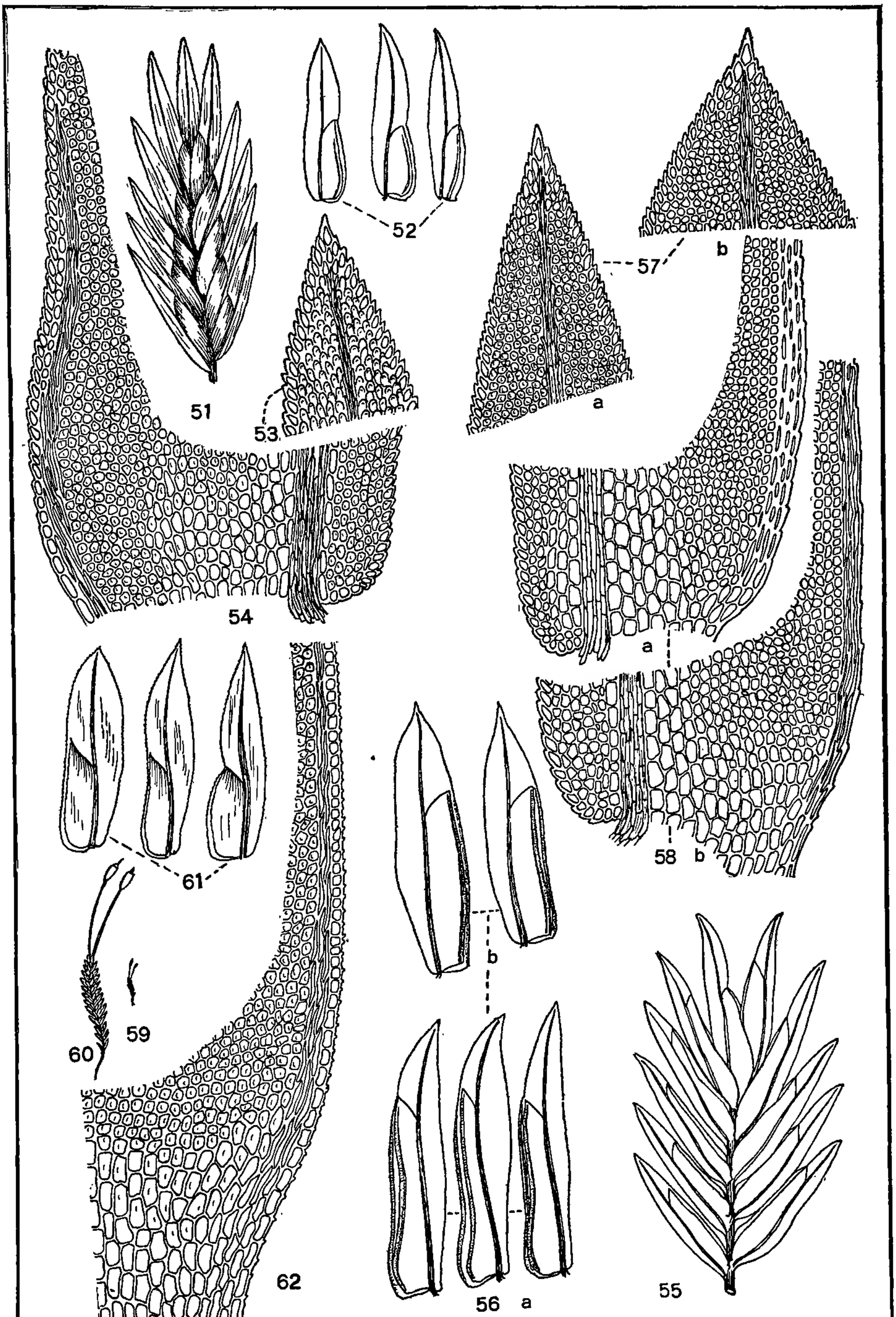
Fig. 51. Part of plant. × 13⅓. Fig. 52. Leaves. × 20. Fig. 53. Leaf-apex. × 200. Fig. 54. Basal and marginal cells. × 200.

Figs. 55–58. *Fissidens elegans* Brid.

Fig. 55. Part of plant. × 13⅓. Fig. 56. Leaves: *a*, from type; *b*, from *Steere 5292*. × 20. Fig. 57. Leaf-apices: *a*, from type; *b*, from *Steere 5292*. × 200. Fig. 58. Basal cells: *a*, from type; *b*, from *Steere 5292*. × 200.

Figs. 59–62. *Fissidens densiretis* Sull.

Fig. 59. Plant. × ⅔. Fig. 60. Plant. × 3⅓. Fig. 61. Leaves. × 20. Fig. 62. Basal and marginal cells. × 200.




FISSIDENS

## Plate 5

Figs. 63–70. *Fissidens muriculatus* Mitt.

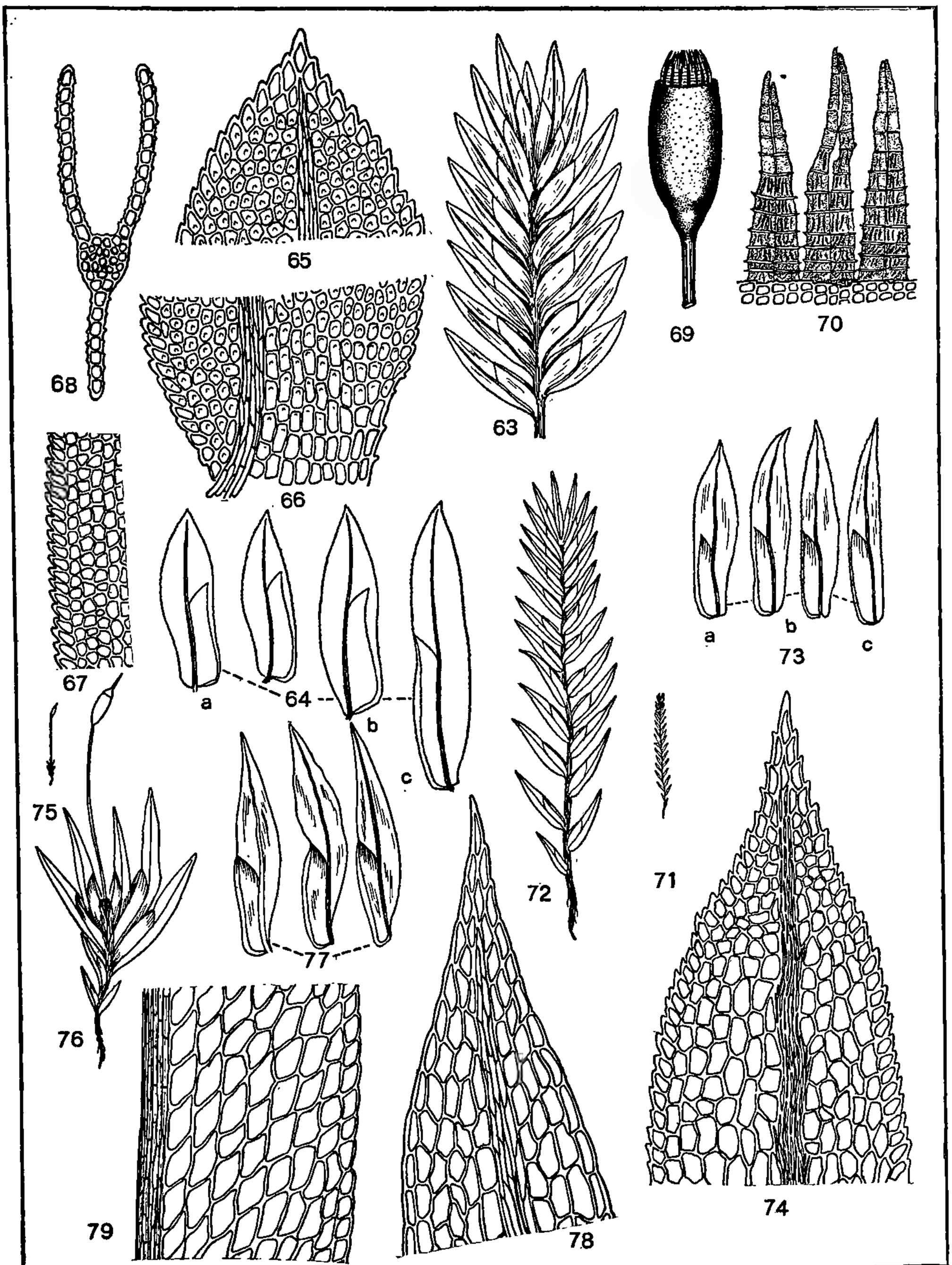
Fig. 63. Part of plant. × 13⅓. Fig. 64. Leaves: *a*, lower; *b*, upper; *c*, perichaetial. × 20. Fig. 65. Leaf-apex. × 200. Fig. 66. Basal cells. × 200. Fig. 67. Margin of vaginant lamina. × 200. Fig. 68. Cross section of leaf. × 200. Fig. 69. Capsule. × 13⅓. Fig. 70. Part of peristome. × 200.

Figs. 71–74. *Fissidens flexinervis* Mitt.

Fig. 71. Plant. × ⅔. Fig. 72. Plant. × 6⅔. Fig. 73. Leaves: *a*, lower; *b*, middle; *c*, perichaetial. × 20. Fig. 74. Leaf-apex. × 200.

Figs. 75–79. *Fissidens inaequalis* Mitt.

Fig. 75. Plant. × ⅔. Fig. 76. Plant. × 6⅔. Fig. 77. Leaves. × 20. Fig. 78. Leaf-apex. × 200. Fig. 79. Medial margin. × 200.




FISSIDENS

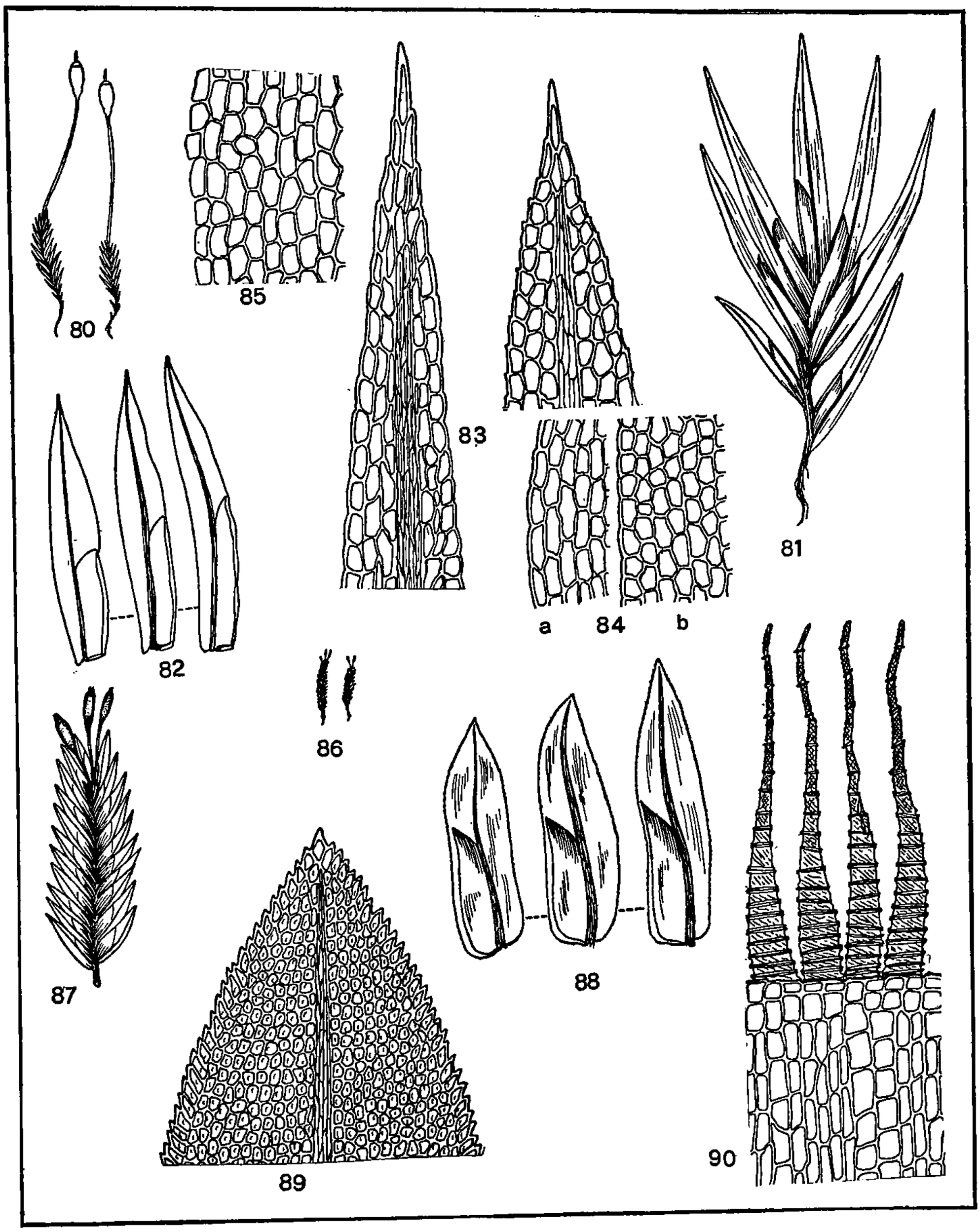
## Plate 6

Figs. 80–85. *Fissidens validicostatus* C. Müll.

Fig. 80. Plants. × 3⅓. Fig. 81. Plant. × 20. Fig. 82. Leaves. × 20. Fig. 83. Leaf-apices. × 200. Fig. 84. Marginal cells: *a*, of vaginant lamina; *b*, of dorsal lamina. × 200. Fig. 85. Medial leaf-cells. × 200.

Figs. 86–90. *Fissidens cylindraceus* Mitt.

Fig. 86. Plants. × ⅔. Fig. 87. Part of plant. × 3⅓. Fig. 88. Leaves. × 20. Fig. 89. Leaf-apex. × 200. Fig. 90. Part of peristome and adjacent cells. × 200.




FISSIDENS

## Plate 7

Figs. 91–99. *Fissidens stenopteryx* Besch.

Fig. 91. Plant. × 5. Fig. 92. Archegonial plant. × 10. Fig. 93. Antheridial plant. × 10. Fig. 94. Part of plant. × 13⅓. Fig. 95. Leaves. × 20.* Fig. 96. Antheridial branch. Fig. 97. Cross section of leaf. × 200. Fig. 98. Leaf-apex. × 200. Fig. 99. Marginal cells. × 200.

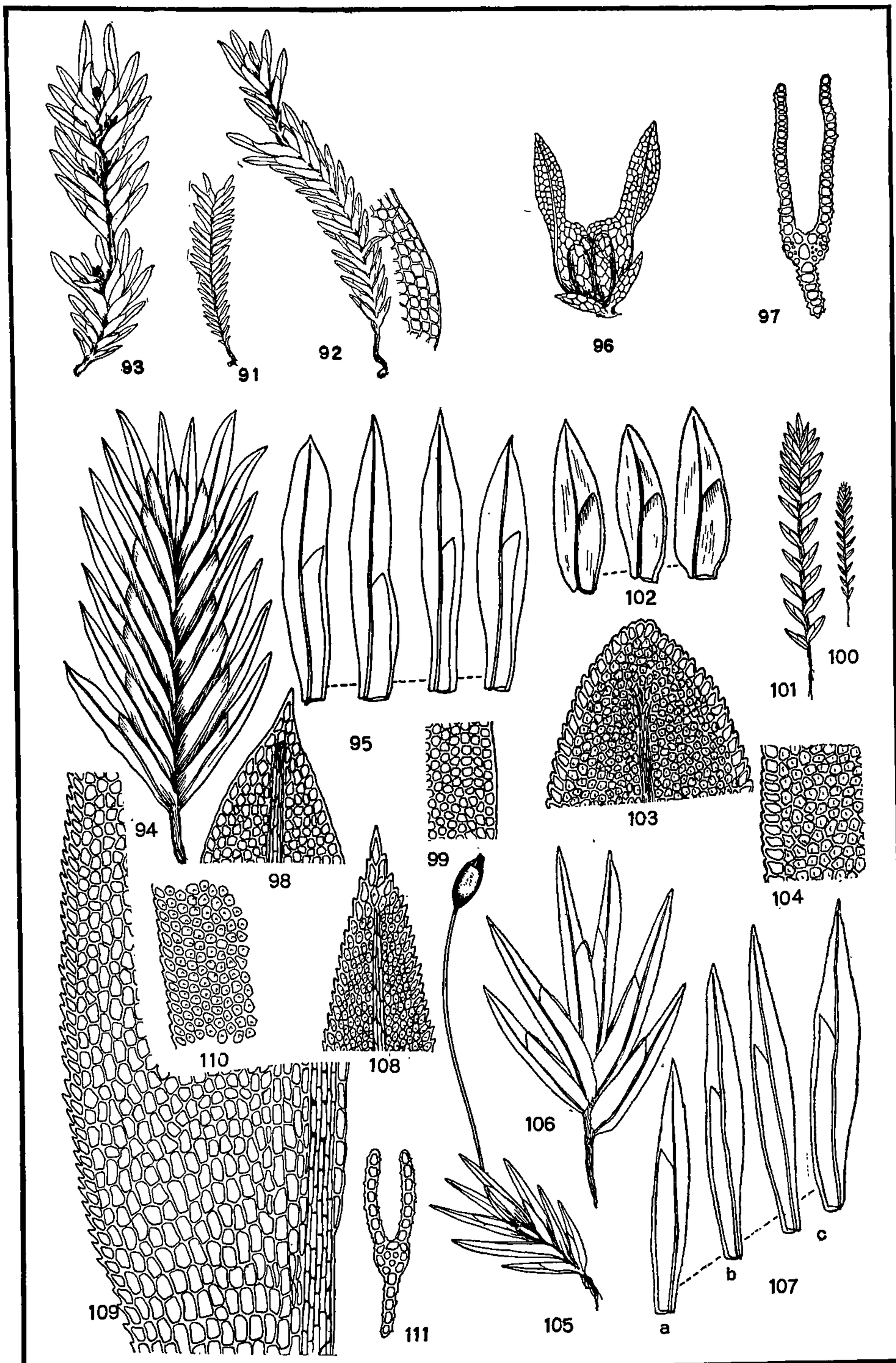
Figs. 100–104. *Fissidens Steerei* Grout.

Fig. 100. Plant. × ⅔. Fig. 101. Plant. × 3⅓. Fig. 102. Leaves. × 20. Fig. 103. Leaf-apex. × 200. Fig. 104. Marginal cells. × 200.

Figs. 105–111. *Fissidens Vardei* Thér.

Fig. 105. Plant. × 6⅔. Fig. 106. Plant. × 13⅓. Fig. 107. Leaves: *a*, lower; *b*, upper; *c*, perichaetial. × 20. Fig. 108. Leaf-apex. × 200. Fig. 109. Margin and vaginant lamina of perichaetial leaf. × 200. Fig. 110. Medial margin. × 200. Fig. 111. Cross section of leaf. × 200.

* The dorsal lamina illustrated is too wide at base.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FISSIDENS

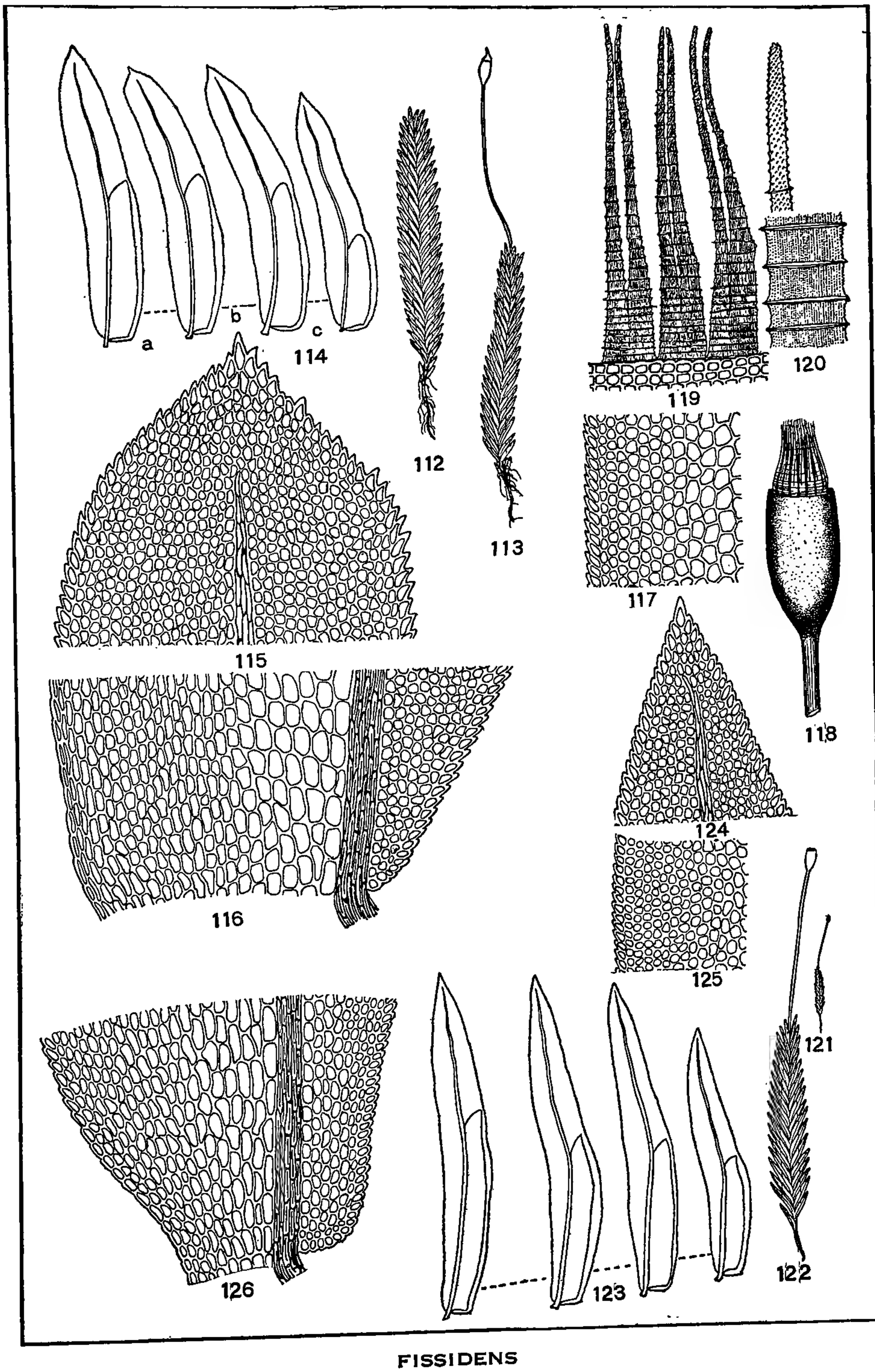
## Plate 8

Figs. 112–120. *Fissidens asplenioides* Hedw.

Fig. 112. Plant. × 3⅓. Fig. 113. Fruiting plant. × 3⅓. Fig. 114. Leaves: *a*, upper; *b*, middle; *c*, lower. × 20. Fig. 115. Leaf-apex. × 200. Fig. 116. Basal cells. × 200. Fig. 117. Margin of vaginant lamina. × 200. Fig. 118. Capsule. × 13⅓. Fig. 119. Part of peristome. × 100. Fig. 120. Detail of peristome. × 400.

Figs. 121–126. *Fissidens similiretis* Sull.

Fig. 121. Plant. × ⅔. Fig. 122. Plant. × 3⅓. Fig. 123. Leaves. × 20. Fig. 124. Leaf-apex. × 200. Fig. 125. Margin of vaginant lamina. × 200. Fig. 126. Basal cells. × 200.



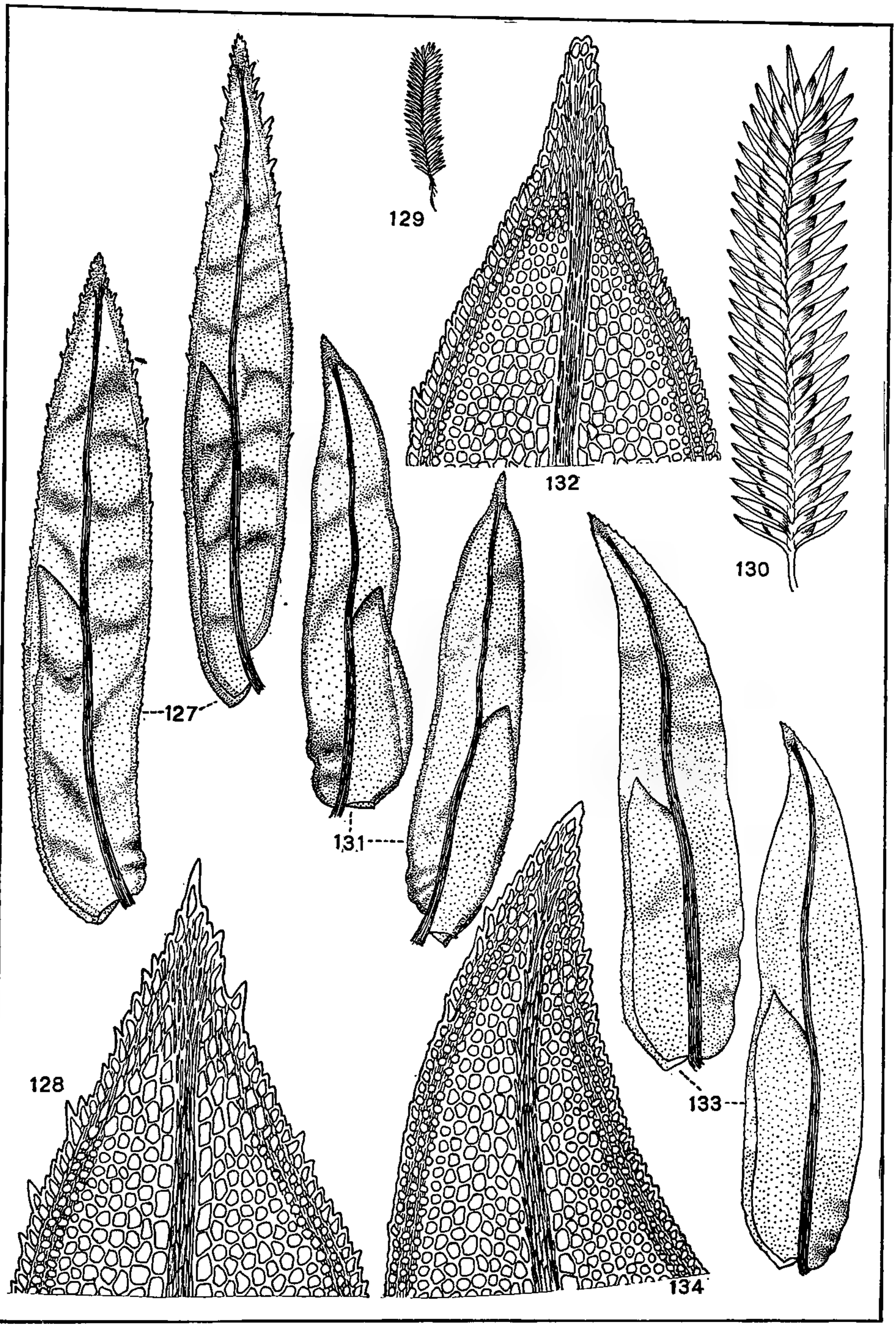

FISSIDENS

PLATE 9

Figs. 127, 128. *Fissidens austroadiantoides* C. Müll.
Fig. 127. Leaves. × 20. Fig. 128. Leaf-apex. × 200.

Figs. 129–132. *Fissidens Bourgaeanus* Besch.
Fig. 129. Plant. × ⅔. Fig. 130. Plant. × 3⅓. Fig. 131. Leaves. × 20. Fig. 132. Leaf-apex. × 200.

Figs. 133, 134. *Fissidens incrassatolimbatus* Card.
Fig. 133. Leaves. × 20. Fig. 134. Leaf-apex. × 200.




FISSIDENS

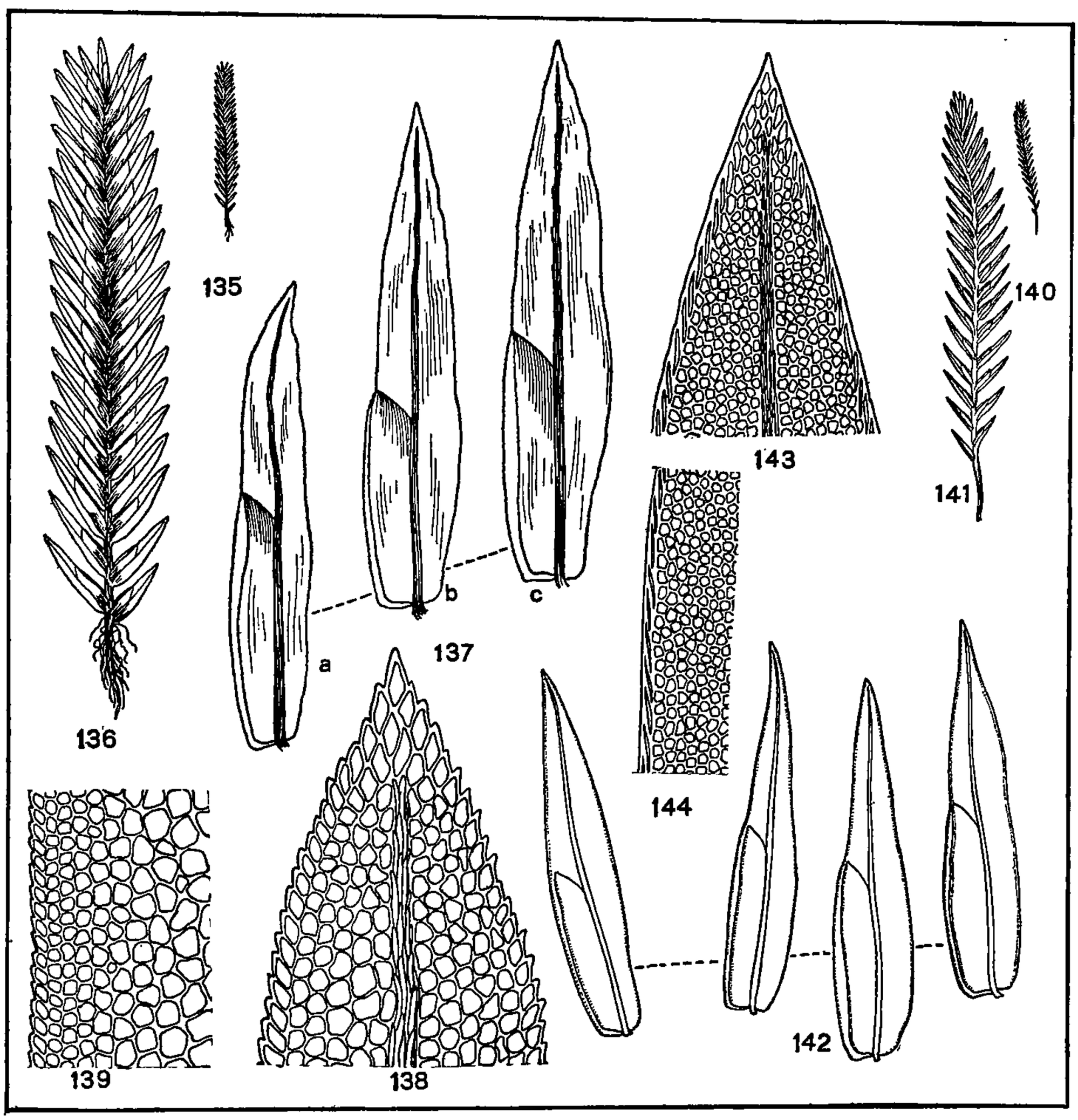
## Plate 10

Figs. 135–139. *Fissidens diversiretis* Hand.-Mazz.

Fig. 135. Plant. × ⅔. Fig. 136. Plant. × 3⅓. Fig. 137. Leaves: *a*, lower; *b*, middle; *c*, upper. × 20. Fig. 138. Leaf-apex. × 200. Fig. 139. Medial leaf-margin. × 200.

Figs. 140–144. *Fissidens rochensis* Broth.

Fig. 140. Plant. × ⅔. Fig. 141. Plant. × 3⅓. Fig. 142. Leaves. × 20. Fig. 143. Leaf-apex. × 200. Fig. 144. Leaf-margin. × 200.

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